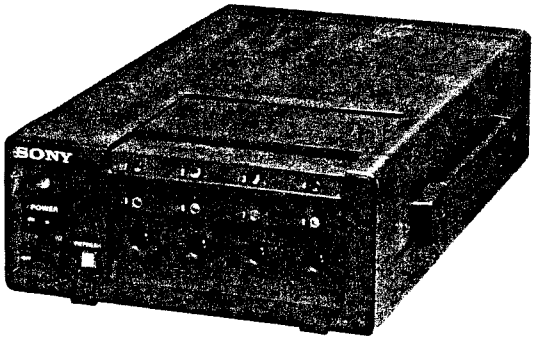
SONY

BATTERY CHARGER

BC-410
BC-410CE



OPERATION AND MAINTENANCE MANUAL

1st Edition

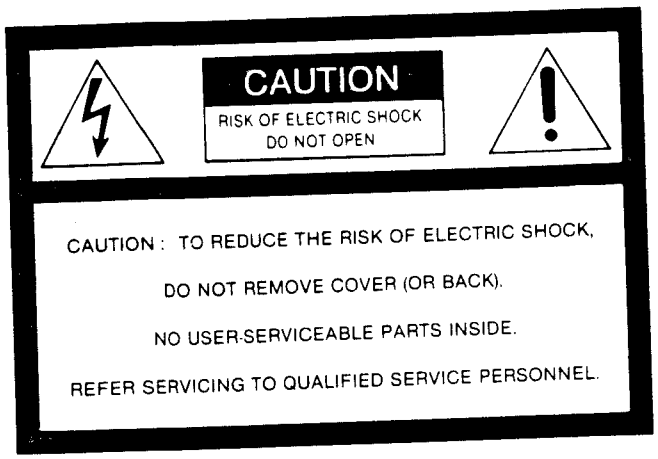
Serial No. 10001 and Higher (J)

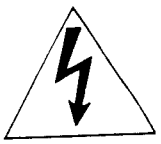
Serial No. 10001 and Higher (UC)

Serial No. 10001 and Higher (EK)

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION : TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Warning—This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Important—To insure that the complete system (including this peripheral) is capable of complying with the FCC requirements, it is recommended that the user make sure that the individual equipment of the complete system has a label with one of the following statements.
"This equipment has been tested with a Class A Computing Device and has been found to comply with Part 15 of FCC Rules."
—or—
"This equipment complies with the requirements in Part 15 of FCC Rules for a Class A Computing Device."
—or equivalent.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart J of Part 15 of FCC Rules.

For the customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

Pour les utilisateurs au Canada

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiés dans le Règlement sur le brouillage radioélectrique.

WARNING FOR THE CUSTOMERS IN THE UNITED KINGDOM
THIS APPARATUS MUST BE EARTHED to your 3-pin plug in accordance with following instructions.

IMPORTANT
The wires in this mains lead are coloured in accordance with the following code:

Green-and yellow:	Earth (safety earth)
Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured marking identifying the terminals in your plug, proceed as follows:
The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked with the letter E or by the safety earth symbol ⏚ or coloured green or green-and yellow.
The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

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KAPITEL 1 BETRIEB

1-1. Überblick

Das BC-410/410CE ist ein Batterie-Ladegerät mit Anschlußmöglichkeiten für bis zu acht Akkupacks (vier NP-1/1A/1B und vier BP-90/90A).

Merkmale

Bis zu acht Akkupacks anschließbar
An das BC-410/410CE können bis zu jeweils vier Akkupacks NP-1/1A/1B und BP-90/90A angeschlossen und der Reihe nach aufgeladen werden. Durch Austauschen bereits aufgeladener gegen erschöpfte Akkupacks ist auch fortlaufendes Aufladen mit weiteren Akkupacks möglich.

Kompakt und leicht
Das BC-410/410CE zeichnet sich durch eine kompakte und leichte Bauweise aus und besitzt einen praktischen Tragegriff.

Auffrisch-Funktion
Wenn Akkupacks wiederholt in nicht vollständig entladenem Zustand aufgeladen werden, kann ihre Ladefähigkeit durch Gedächtniseffekte (Beeinflussung der Aufladung durch die Restladung der Batterie) zurückgehen. Die Auffrisch-Funktion verhindert das Auftreten solcher Effekte durch vollständiges Entladen des Akkupacks vor dem Aufladen.

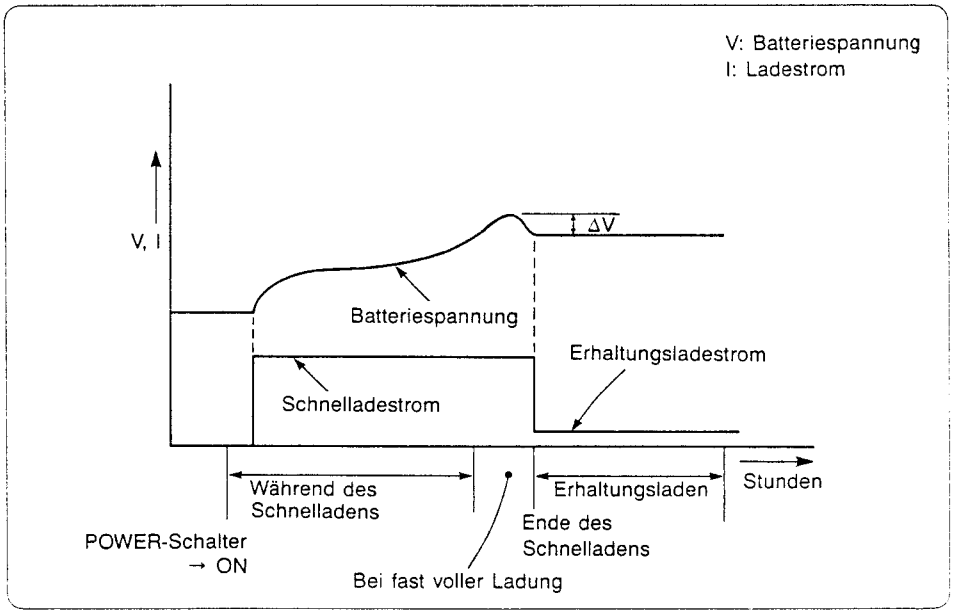
Diagnose-Funktion
Das BC-410/410CE besitzt eine Diagnose-Funktion zur Prüfung der angeschlossenen Akkupacks. Wenn ein Pack nicht einwandfrei geladen werden kann oder sich überhitzt, weist eine Kontrollampe auf den irregulären Zustand hin.

Bescheinigung des Herstellers
Hiermit wird bescheinigt, daß das Batterie-Ladegerät BC-410/410CE in Übereinstimmung mit den Bestimmungen der EG-Richtlinie 82/499/EWG funkentstört ist.
Der Deutschen Bundespost wurde das Inverkehr-bringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.
Sony Corporation

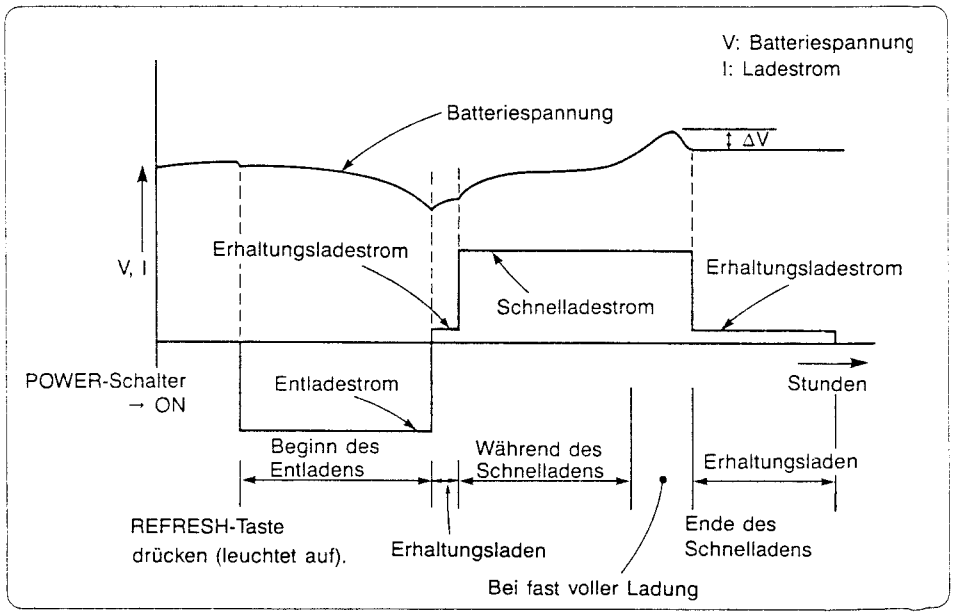
Hinweis
Gemäß dem Amtsblatt des Bundesministers für das Post- und Fernmeldewesen Nr. 163/1984 wird der Betreiber darauf aufmerksam gemacht, daß die von ihm mit diesem Gerät zusammengestellte Anlage auch den technischen Bestimmungen dieses Amtsblattes genügen muß.

Mit dem Einschalten des BC-410/410CE beginnt das Aufladen. Auf Erfassung des gegen Ende des Aufladens auftretenden Spannungsabfalls ΔV schaltet sich das Gerät von Schnelladen auf Erhaltungsladen (Laden mit kleinem Ladestrom), um eine volle Ladung sicherzustellen. Das Laden beginnt mit dem Pack am Anschluß mit der niedrigsten Anschlußnummer. Während des Auffrischens bzw. Aufladens eines Packs werden die weiteren angeschlossenen Packs mit Ausnahme zum Auffrischen anstehender Packs durch Erhaltungsladen stabilisiert.

Aufladen ohne Auffrischen



Aufladen nach Auffrischen



1-2. Vorsichtsmaßregeln

Um einwandfreien Betrieb zu gewährleisten, sind die folgenden Punkte zu beachten:

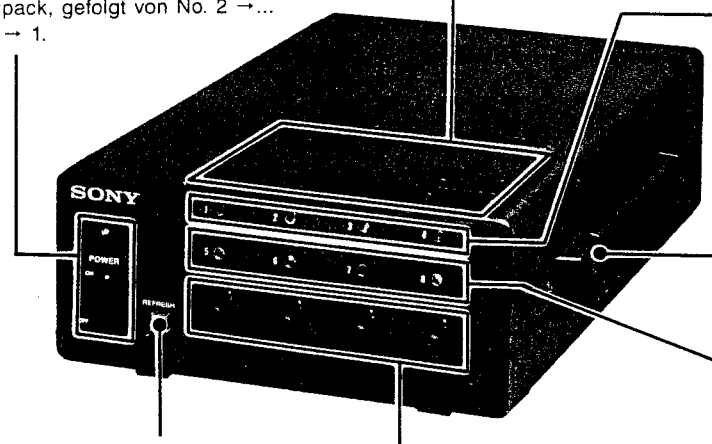
- Das BC-410/410CE ist für den Temperaturbereich von 0°C bis 40°C geeignet. Niedrige Temperaturen erschweren allerdings die Aufladung. Es wird daher empfohlen, das Laden der Batteriepacks bei einer Umgebungstemperatur im Bereich von 10°C bis 35°C durchzuführen.
- Das Gerät nicht an Orten lagern oder benutzen, an denen es Staub oder korrodierenden Gasen ausgesetzt ist.
- Direkte Sonnenbestrahlung bei Betrieb und Lagerung vermeiden.
- Die Be- und Entlüftungsschlitze nicht blockieren.

1-3. Lage und Funktion der Teile

Frontseite

Netzschalter (POWER) und Netzkontrollampe
Zum Einschalten des Gerätes die ON-Seite des POWER-Schalters drücken (Netzkontrollampe leuchtet auf).
Auf Einschalten des Gerätes beginnt das Laden mit dem an Anschluß No. 1 angeschlossenen Akkupack, gefolgt von No. 2 →... → 8 → 1.

Anschlüsse 1 bis 4 (für NP-1/1A/1B)
Zum Laden von Akkupacks des Typs NP-1/1A/1B. Es können bis zu vier Packs gleichzeitig angeschlossen werden.



Kontrollampen 1 bis 4 (für NP-1/1A/1B)
Diese Lampen geben Auskunft über den Zustand der angeschlossenen Akkupacks. Näheres hierzu unter „Anzeigearten und deren Bedeutung" auf Seite 1-5 (G).

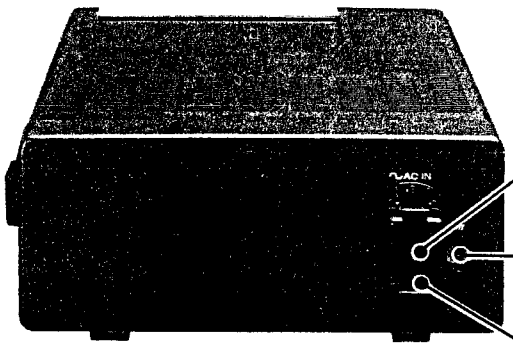
Tragegriff
Erleichtert das Tragen des BC-410/410CE.

Kontrollampen 5 bis 8 (für BP-90/90A)
Diese Lampen geben Auskunft über den Zustand der angeschlossenen Akkupacks. Näheres hierzu unter „Anzeigearten und deren Bedeutung" auf Seite 1-5 (G).

Auffrisch-Taste (REFRESH)
Auf Drücken dieser Taste (leuchtet auf) werden die angeschlossenen Akkupacks in der Reihenfolge No. 1, dann No. 2 →...→ 8 → 1 aufgefrischt und aufgeladen.
Zum Deaktivieren der Auffrisch-Funktion erneut diese Taste drücken.

Anschlüsse 5 bis 8 (für BP-90/90A)
Zum Laden von Akkupacks des Typs BP-90/90A. Es können bis zu vier Packs gleichzeitig angeschlossen werden.

Rückseite



Netzeingang (AC IN)
Für die Stromversorgung über das mitgelieferte Netzkabel.

Erdklemme
Falls erforderlich, kann das Gerät über diese Klemme geerdet werden.

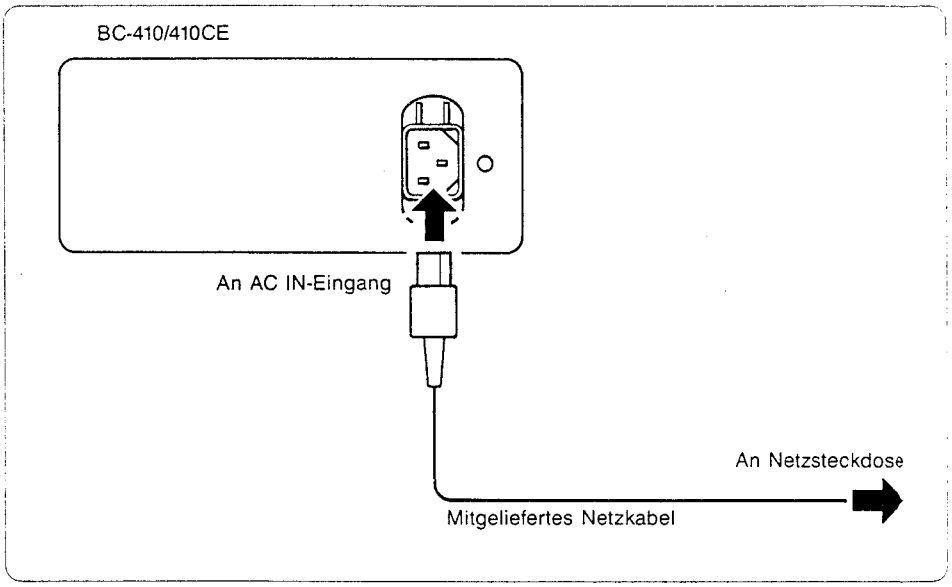
Steckerhalter
Zum Sichern des Netzkabelsteckers.

Anzeigearten und deren Bedeutungen

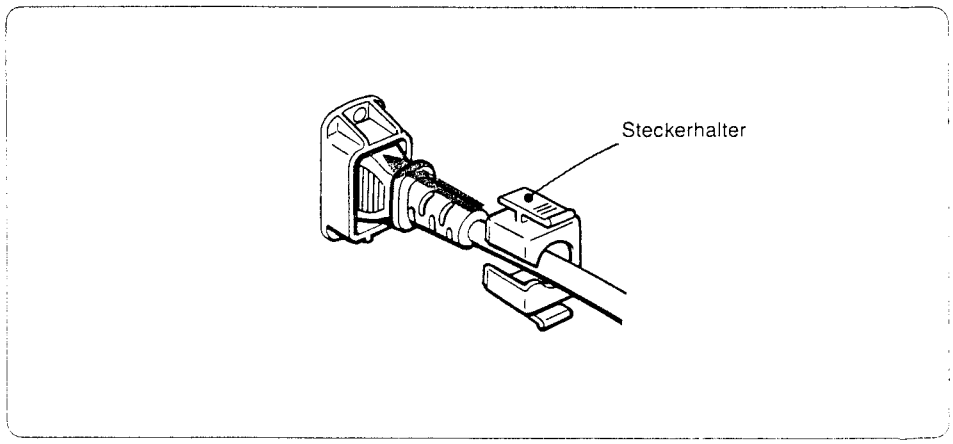
Anzeigeart	Bedeutung
Langsames Blinken, grün	Pack wird schnellgeladen
Schnelles Blinken, grün	Schnelladen kurz vor dem Abschluß
Dauerleuchten, grün	Schnelladen beendet oder Erhaltungsladen
Langsames Blinken, rot	Pack wird aufgefrischt (Restladung des Packs wird entladen)
Dauerleuchten, rot	Auffrischen beendet
Abwechselndes Leuchten in Rot und Grün	Die Diagnosefunktion ermittelte einen der folgenden Zustände: • Batteriespannung nach Ablauf der Soll-Schnelladezeit unterhalb der Sollspannung. • Batterie überladen, über vier Stunden mit weniger als 1A Ladestrom verstrichen. • Keine Erfassung von $-\Delta V$ (Aufladungsende) innerhalb des vorgegebenen Zeitraums durch das Ladekontrollsystem. • Akkupack überhitzt und Schutzschaltung aktiviert. In solchen Fällen zwei bis drei Mal versuchen, das betreffende Akkupack wieder aufzuladen. Falls sich wieder die gleiche Anzeige ergibt, ist das Pack vermutlich defekt und sollte ausgetauscht werden.

1-4. Anschlüsse

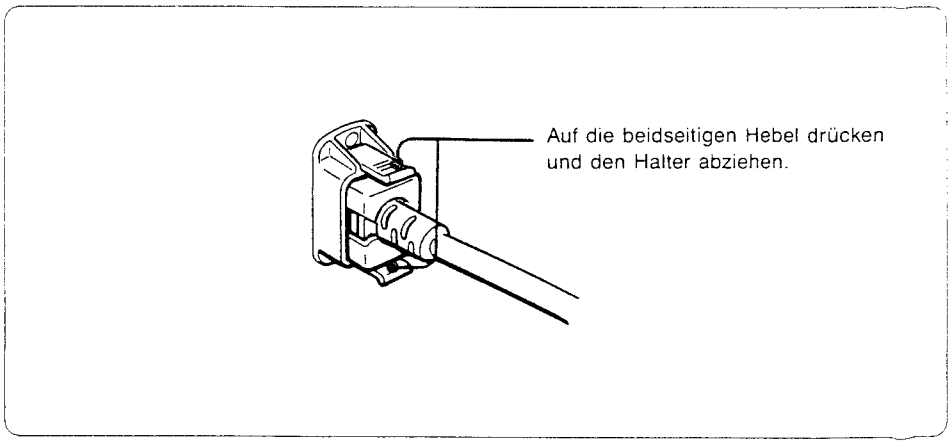
Anschluß an die Netzsteckdose



Anbringung des Steckerhalters



Abnehmen des Steckerhalters



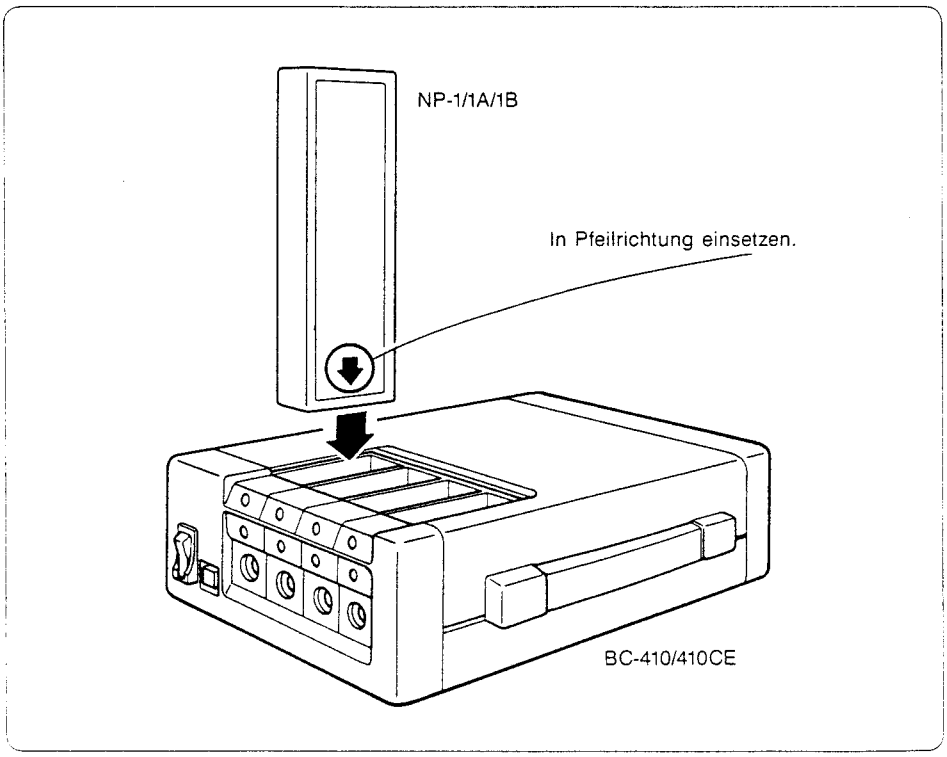
1-5. Ladebetrieb

1-5-1. Anschließen der Akkupacks

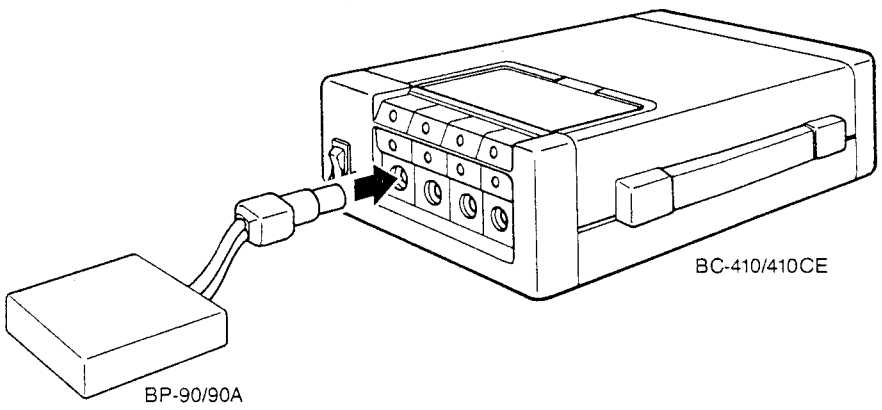
Die aufzuladenden Akkupacks gemäß nachstehender Anleitung anschließen.

Akkupack NP-1/1A/1B

Den Deckel öffnen und das Akkupack so einsetzen, daß der Boden des Packs fest in Berührung mit dem Boden des Anschlußteils des BC-410/410CE steht.



Den Stecker des Akkupacks fest in die Buchse des BC-410/410CE schieben.



1-5-2. Laden der Akkupacks

Auf Einschalten des Netzschalters beginnt das Aufladen mit dem Akkupack, das an den Anschluß mit der niedrigsten Nummer angeschlossen ist. Näheres zu den Anzeigefunktionen der Kontrollampen finden Sie auf Seite 1-5 (G) in Tabelle „Anzeigearten und deren Bedeutungen" unter „1-3. Lage und Funktion der Teile".

Auffrischen durch Entladen und Laden

Zur Vermeidung von Gedächtniseffekten wird empfohlen, zum Laden nicht vollständig entladener Akkupacks die Auffrisch-Betriebsart zu verwenden. Dazu ist nach dem Einschalten des Ladegerätes die REFRESH-Taste zu drücken. Die angeschlossenen Akkus werden daraufhin vollständig entladen und anschließend aufgeladen.
Näheres zu den Anzeigefunktionen der Kontrollampen finden Sie in Tabelle „Anzeigearten und deren Bedeutungen" unter „1-3. Lage und Funktion der Teile".

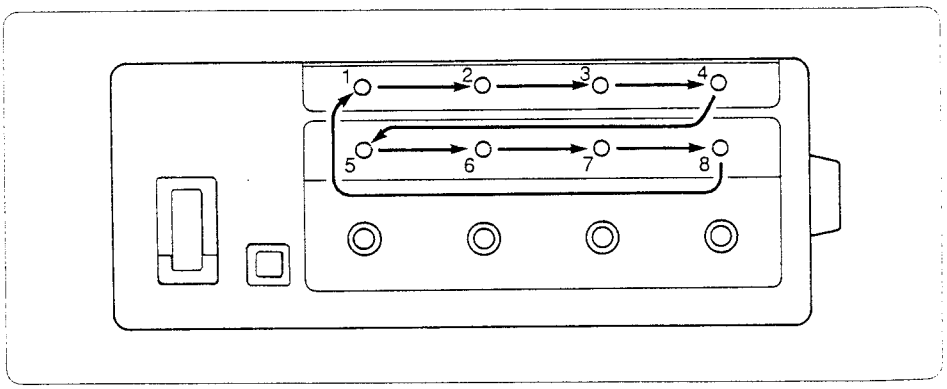
Deaktivieren der Auffrisch-Funktion
Erneut die REFRESH-Taste drücken. Das Gerät schaltet sich dadurch von Auffrisch-Betrieb auf Schnelladen, beginnend mit dem Akkupack von Anschluß No. 1.

Hinweise zum Auffrisch-Betrieb

- Ein Auffrischzyklus beansprucht die Akkupacks in gleicher Weise wie ein Lade- und Entladezyklus. Die Lebensdauer der Akkupacks beträgt etwa 500 Aufladungen und wird durch häufiges Auffrischen entsprechend verkürzt. Es wird daher empfohlen, das Auffrischen der Packs nur etwa jedes zehnte Mal durchzuführen.
- Nach abgeschlossenem Schnelladen sowie nach etwa 3 Minuten ab Beginn des Schnelladens läßt sich das Gerät nicht mehr mit der REFRESH-Taste auf Auffrischbetrieb schalten.
- Während des Auffrischens wird das Geräteinnere von Gebläsen gekühlt. Um die Luftzirkulation nicht zu behindern, ist beim Auftellen des BC-410/410CE auf einen Abstand von etwa 20 bis 30 cm von der Geräterückseite zur Wand zu achten.

Auflade-Reihenfolge

Das Aufladen beginnt mit dem Akkupack am Anschluß mit der niedrigsten belegten Anschlußnummer. Wenn alle angeschlossenen Packs in der Reihenfolge No. 1 bis 8 aufgeladen sind, beginnt das Aufladen erneut ab Anschlußnummer 1.



Geeignete Akkupacks und Ladezeit

In der nachstehenden Tabelle sind die für dieses Gerät geeigneten Akkupacks mit den jeweils erforderlichen Ladezeiten bei vollständig entladenem Pack und 25°C aufgelistet.

Geeignete Akkupacks	NP-1	NP-1A	NP-1B	BP-90	BP-90A
Ladezeit	Circa 60 Min.	Circa 70 Min.	Circa 90 Min.	Circa 140 Min.	Circa 160 Min.

Hinweis zur Ladezeit
Die Leistungskennwerte des BC-410/410CE sind nur für die geeigneten Akkupacks garantiert. Das Gerät nicht zum Laden anderer Akkupacks verwenden.

Dauerbetrieb

Wenn das Aufladen eines Akkupacks beendet ist, leuchtet die dazugehörige Kontrollampe grün. Falls weitere Packs zu laden sind, können bei laufendem Laden der angeschlossenen Akkupacks die bereits aufgeladenen Packs gegen entladene Packs ausgetauscht werden. Die neu angeschlossenen Packs werden dann der Reihe nach aufgeladen.

Beenden des Aufladens

Zum Beenden des Ladebetriebs den POWER-Schalter ausschalten.

1-6. Technische Daten

Stromversorgung	100 - 240V WS, 50/60 Hz
Leistungsaufnahme	75 W
Betriebstemperatur	0°C bis 40°C
Lagertemperatur	−20°C bis +60°C
Luftfeuchte	5 bis 90% (rel. Feuchtigkeit)
Abmessungen	212 × 85 × 325 mm (B/H/T)
Gewicht	ca. 4 kg
Ladeprinzip	Konstantstrom-Aufladung
Ladekontrollsystem	Schnelladen mit −ΔV-Kontrolle (Detektion des Abfalls der Batteriespannung um −ΔV gegen Aufladungsende)

Geeignete Akkupacks und deren Ladezeiten

Geeignete Akkupacks	NP-1	NP-1A	NP-1B	BP-90	BP-90A
Ladezeit	Circa 60 Min.	Circa 70 Min.	Circa 90 Min.	Circa 140 Min.	Circa 160 Min.

Schnelladestrom	NP-1/1A/1B: ca. 2,0 A BP-90/90A: ca. 2,5 A
Entladestorm	NP-1/1A/1B: ca. 1,1 A BP-90/90A: ca. 2,0 A
Löschspannung	ca. 10,3 V
Mitgeliefertes Zubehör	Netzkabel (1)

Änderungen, die dem technischen Fortschritt dienen, bleiben vorbehalten.

SECTION 2
CIRCUIT DESCRIPTION

2-1. Battery Detection Circuit

The C board (HB01271C Ass'y) is a battery detection circuit for the BP-90/90A battery pack and the D board (HB01271D Ass'y) is for the NP-1/1A/1B battery pack. The circuits operate as follows.

NP-1/1A/1B:

① The NP-1/1A/1B battery pack is inserted into the battery case.
② The switches from the SW301 to SW304/D board are turned on.
③ The level at the battery detection terminals (from the pin 51 to pin 54) of the microcontroller IC303 on the H board changes from high (+5V) to low (0V). From this, the circuit concludes that the battery pack has been inserted.

BP-90/90A:

① The BP-90/90A battery pack is plugged in jacks from the OUT5 to OUT8 on the C board.
② Signal contact point of jack (C terminal) is disconnected from the plus terminal.
③ The level at the battery detection terminals (the pin 42 and from the pin 48 to pin 50) of the microcontroller IC303 on the H board becomes low (0V). From this, the circuit concludes that the battery pack has been inserted.

2-2. Power Supply Circuit

2-2-1. Constant-voltage/Constant-current Control Circuit

The A board (HB01271A Ass'y) is a constant-voltage/ constant-current control circuit.

Operation of Constant-current control circuit

① The operational amplifier IC103(2/2) /A board detects fall of voltage at the R140 boosting-charge current detection resistor on the H board.
② By changing the reference voltage at the operational amplifier IC103 (2/2) using the transistor Q103/A board, the current value is valiable.
The current value is 2.5A with the Q103 turned on, and is 2.0A with the Q103 turned off.
③ Output from the IC103 (2/2) is feedbacked to the switching control IC (IC101/A board) via the photocoupler PC101/A board.
④ By controlling the IC101-pin 2 output and the switching FET (Q101/H board) oscillation, boosting-charge current is maintained constantly.

Operation of Constant-voltage control circuit

① The operational amplifier IC103(1/2)/A board detects across voltage of the C122 secondary-side smoothing capacitor on the H board.
② Output from the IC103(1/2) is feedbacked to the switching control IC (IC101/A board) via the photocoupler PC101/A board.
③ By controlling the IC101-pin 2 output and the switching FET (Q101/H board) oscillation, across voltage of the C122 is maintained constantly.

2-2-2. +5V Constant-voltage Power Supply Circuit.

The IC102 +5V constant-voltage power supply circuit sends constant-voltage of +5V from the pin 5. Normally the output voltage at the IC102 is stabilized with the input voltage of about 9V through 20V at the IC102. However, when the power is just turned on, or the current of over 1.1A is sent to the +5V output circuit, the microcontroller IC303 is reset as described below because of the unstabilized output voltage at the IC102.

2-2-3. Reset Circuit for Microcontroller IC303

When the power is just turned on, or the current of over 1.1A is sent to the +5V output circuit, the IC102/H board resets the microcontroller IC303.

① When the power is just turned on, the C125 capacitor/H board connected to the pin 2 of IC102 starts to charge. Until the voltage of the C125 reaches about 4.8V, the pin 4 of the IC102 outputs the low level (0V) to reset the IC303. If the voltage is over 4.8V, the IC102 outputs the high level (5V) and cancels resetting the IC303.

② When the current of over 1.1A flows to the +5V output circuit, +5V output circuit outputs under 4.8V and the output level at the pin 4 of IC102 changes from high (+5V) to low (0V). This resets the IC303.

2-3. Indication Circuit

2-3-1. POWER-ON Indication Circuit

Operation of POWER-ON indication circuit

① The power switch SW101 of the external equipment is turned on.

② The constant-voltage power supply IC (IC102/H board) starts to feed constant-voltage of +5V.

③ The electric current reaches the LED lamp (LED309/F board) via the R361 resistor on the F board, and the lamp lights in green.

2-3-2. Refresh Discharge Setting/Cancelling Indication Circuit

Operation of Refresh discharge setting indication circuit

① Press the unlit refresh button (SW305/G board) for more than 50m seconds.

② Low voltage (0V) is input to the refresh discharge setting/cancelling terminal (pin 41) and high voltage is output from the refresh discharge setting/cancelling indication terminal (pin 28).

③ The LED driver (Q317/F board) connected to the pin 28 of IC303 is turned on and the SW305/G board lights up.

Operation of Refresh discharge cancelling indication circuit

① Press the lit refresh button (SW305/G board) for more than 50m seconds.

② Low voltage (0V) is input to the refresh discharge setting/cancelling terminal (pin 41) and low voltage is output from the refresh discharge setting/cancelling indication terminal (pin 28).

③ The LED driver (Q317/F board) is turned off and the SW305/G board is unlit.

2-3-3. NG Indication Circuit

Operation of NG indication circuit

① The boosting-charge indication terminal and discharge indication terminal of the IC303 microcontroller correspond to the number of the battery pack insertion block, that is called "Channel" in the following description. (Combinations of the pin 33 and 34 for the channel ①, pin 35 and 36 for the channel ②, pin 37 and 38 for the channel ③, pin 39 and 40 for the channel ④, pin 55 and 56 for the channel ⑤, pin 57 and 58 for the channel ⑥, pin 59 and 60 for the channel ⑦, and pin 61 and 62 for the channel ⑧) The terminals corresponding to the channel number of an NG battery pack oscillate from high to low and to high, alternately at interval of 0.5 seconds.

② The above osillation makes the boosting-charge indication LED driver and discharge indication LED driver (combinations of the Q301 and Q302, Q303 and Q304, Q305 and Q306, Q307 and Q308, Q309 and Q310, Q311 and Q312, Q313 and Q314, and Q315 and Q316) turned on and off alternately at interval of 0.5 seconds.

③ The two-color light emitting diode (LED) connected to the above driver (from the LED301 to LED308) alternately lights in red and in green at interval of 0.5 seconds.

2-3-4. Charge/Discharge Indication Circuit

Performance of Indication during the boosting-charge

① The boosting-charge indication terminal of the IC303/H board (one of the pin 33, pin 35, pin 37, pin 39, pin 55, pin 57, pin 59 and pin 61) oscillates from high to low and to high at interval of 0.9 seconds.

② The boosting-charge indication LED driver connected to the above terminal (one of the Q301, Q303, Q305, Q307, Q309, Q311, Q313, and Q315) is turned on and off alternately at intervals of 0.9 seconds.

③ The green LED of the two-color light emitting diode connected to the above driver (one of from the LED301 to LED308) is lit and unlit alternately at interval of 0.9 seconds.

Performance of Indication around finishing the boosting-charge

① The boosting-charge indication terminal of the IC303/H board (one of the pin 33, pin 35, pin 37, pin 39, pin 55, pin 57, pin 59 and pin 61) oscillates from high to low and to high at interval of 0.3 seconds.

② The boosting-charge indication LED driver connected to the above terminal (one of the Q301, Q303, Q305, Q307, Q309, Q311, Q313, and Q315) is turned on and off alternately at intervals of 0.3 seconds.

③ The green LED of the two-color light emitting diode connected to the above driver (one of from the LED301 to LED308) is lit and unlit alternately at interval of 0.3 seconds.

Performance of Boosting-charge finish indication

① The boosting-charge indication terminal of the IC303/H board (one of the pin 33, pin 35, pin 37, pin 39, pin 55, pin 57, pin 59 and pin 61) outputs the high level.
② The boosting-charge indication LED driver connected to the above terminal (one of the Q301, Q303, Q305, Q307, Q309, Q311, Q313, and Q315) is turned on.
③ The green LED of the two-color light emitting diode connected to the above driver (one of from the LED301 to LED308) is lit.

Performance of Indication during discharging

① The discharge indication terminal of the IC303/H board (one of the pin 34, pin 36, pin 38, pin 40, pin 56, pin 58, pin 60 and pin 62) oscillates from high to low and to high at interval of 0.9 seconds.
② The discharge indication LED driver connected to the above terminal (one of the Q302, Q304, Q306, Q308, Q310, Q312, Q314, and Q316) is turned on and off alternately at intervals of 0.9 seconds.
③ The red LED of the two-color light emitting diode connected to the above driver (one of from the LED301 to LED308) is lit and unlit alternately at interval of 0.9 seconds.

Performance of Discharge finish indication

① The discharge indication terminal of the IC303/H board (one of the pin 34, pin 36, pin 38, pin 40, pin 56, pin 58, pin 60 and pin 62) outputs high level.
② The discharge indication LED driver connected to the above terminal (one of the Q302, Q304, Q306, Q308, Q310, Q312, Q314, and Q316) is turned on.
③ The red LED of the two-color light emitting diode connected to the above driver (one of from the LED301 to LED308) is lit.

2-4. Trickle Charge Circuit

Performance of Trickle charge ON operation

① One of the trickle charge terminals (from the pin 1 to pin 8) of the IC303 microcontroller, corresponding to the trickle-current channel, outputs high level.
② The drivers for trickle-charge switching (from the Q217 to Q224/H board) are turned on, corresponding to the high output at the above terminal.
③ The transistors for trickle-charge switching (from the Q209 to Q216/H board) connected to the above turned-on driver are also turned on.
As the trickle current flows, the constant-current control transistors (from the Q201 to Q208/H board) start the constant-current control for the trickle current.

Performance of Trickle charge OFF operation

① One of the trickle charge terminals (from the pin 1 to pin 8) of the IC303 microcontroller, corresponding to the trickle-current channel, outputs high level and then low level.
② The transistors (from the Q217 to Q224/H board) connected to the above lower trickle charge terminal are turned off.
③ As the transistors for trickle-charge switching (from the Q209 to Q216/H board) connected to the above turned-off transistor are turned off, the trickle current stops flowing.

2-5. Boosting-charge Circuit

2-5-1. Boosting-charge operation

The boosting-charge operation is as follows.

① Beginning of the boosting-charge operation
If two or more battery packs are boosting-charged, the one in the lowest number channel is charged first. However, when the refresh button is lit, the boosting-charge operation will be started.

② Before beginning the boosting-charge operation
Until the boosting-charge operation is started, the trickle current flows in the battery pack in the battery charger. However, when the refresh button is lit, the trickle current does not flow until the refresh discharge stops.

③ When the battery voltage is lower than the voltage at starting the boosting-charge;
(1) The comparator IC401/B board or IC501/L board detects the battery voltage lower than the starting one.
⬇
The transistors for boosting-charge switching (from the Q225 to Q232/H board) are turned off because their drivers (from the Q401 to Q404/B board, from the Q501 to Q504/L board) have been turned off.
⬇
High voltage is detected for 1/2 boosting-charge current (Io) and the standby charge operation is started. The standby charge means the trickle charge before the boosting charge current flows.
(2) The indication during boosting-charge operation is performed.

④ When the battery voltage is higher than the voltage at starting the boosting-charge;
The boosting-charge ON operation and boosting-charge indication are performed. If the performance lasts longer than 120 minutes (from the CH1 to CH4) or 240 minutes (from the CH5 to CH8), the boosting-charge OFF operation and NG indication are performed.

⑤ When the battery voltage becomes above the upper voltage detection voltage (V_H) and the boosting-charge current is below 1/2 boosting-charge current (Io) within 0.5m seconds after the battery voltage is above V_H, the standby boosting-charge operation is performed.

⑥ When the boosting-charge current is below 1/2 boosting-charge current (Io) when 0.5m seconds has past after the battery voltage is above V_H, the boosting-charge finish operation is performed.

2-5-2. Performance of 1/2 boosting-charge current (Io) detection

① When the boosting-charge current is below half the value of constant-current, the comparator IC104 (2/2)/A board outputs high level (+5V).

② When the boosting-charge current is above half the value of constant-current, the IC104 (2/2)/A board outputs low level (0V).

2-5-3. Detection of Upper-voltage detection voltage (V_H)

① When the battery voltage is below the upper-voltage detection voltage, the comparator IC104 (1/2)/A board outputs high level (+5V).

② When the battery voltage is above the upper-voltage detection voltage, the IC104 (1/2)/A board outputs low level (0V).

2-5-4. Standby charge operation

The trickle charge ON operation and the boosting-charge indication are performed.

(1) If the performance lasts longer than 120 minutes, the trickle charge OFF operation and NG indication will be performed.

(2) During the standby charge operation, an analog voltage fed to the analog input terminal (pin 47) of the microcontroller IC303/H board is not converted into the digital data. Therefore, $-\triangle V$ is not detected.

2-5-5. Boosting-charge ON operation

① One of the boosting-charge terminals (from the pin 9 to pin 16) of the microcontroller IC303/H board, corresponding to the boosting-charge channel, outputs high level (+5V).

② One of the transistors (from the Q401 to Q404/B board, or from the Q301 to Q504/L board), connected to the above high boosting-charge terminal, is turned on.

③ One of the transistors for boosting-charge switching (from the Q225 to Q232/H board), connected to the above turned-on transistor, is turned on and the boosting-charge current flows.

2-5-6. Boosting-charge OFF operation

① One of the boosting-charge terminals (from the pin 9 to pin 16) of the microcontroller IC303/H board, corresponding to the operation channel, goes from high (+5V) to low.

② One of the transistors (from the Q401 to Q404/B board, or from the Q501 to Q504/L board), connected to the above lower boosting-charge terminal, is turned off.

③ One of the transistors for boosting-charge switching (from the Q225 to Q232/H board), connected to the above turned-off transistor, is turned off and the boosting-charge current stops.

2-5-7. Boosting-charge finish operation

- The boosting-charge OFF operation and the trickle charge ON operation are performed. If the performance lasts longer than about 24 hours, the trickle charge OFF operation is performed.
- The boosting-charge finish indication is performed.

2-5-8. Performance of $-\triangle V$ detection

$-\triangle V$ detection circuit detects the voltage drops of a battery which occurs near the end of charging as follows.

① After about three minutes since the boosting-charge current begins to flow, $-\triangle V$ detection operation is started.

② Across voltage of the secondary-side smoothing capacitor C122/H board is clipped by the zener voltage and divided by the resistance-type potential division circuit. Clipped and divided voltage is fed to the analog input terminal (pin 47) of the microcontroller IC303.

③ Analog data at the analog input terminal is converted into digital data at interval of 10m seconds. The average value of every 2.56 seconds is figured out and memorized.

④ Every digital average value is compared with the preceding average value. If the new one is bigger, it is memorized as the peak value.

⑤ When the new digital average value is smaller than the peak value by two units, the indication around finishing the boosting-charge is performed.

⑥ When the new digital average value is smaller than the peak value by three units and continues for 12.8 seconds (when $-\triangle V$ is detected), the boosting-charge finish operation is performed.

2-6. Discharge Circuit

Performance of Discharge ON operation

① One of the discharge terminals (from the pin 17 to pin 24) of the IC303 microcontroller, corresponding to the operation channel, outputs high level.

② One of the drivers (from the Q318 to Q325/H board) for relays (from the RY301 to RY308/H board), connected to the high discharge terminal, is turned on.

③ The relay connected to the turned-on driver is turned on and an electric current goes to the zener diode (ZD307/H board), that functions as reference voltage of the operational amplifier (IC302/H board) for discharge current control. And also the current goes to the fan motor FM301, the fan starts to cool the discharge circuit.

④ The IC302/H board detects the electric current at the R338 discharge current detection resistor on the H board and controls the current output to the discharge current control transistor (Q326, Q329/I board).Therefore, the discharge current flows constantly.

Performance of Discharge OFF operation

① Output of the discharge terminal of the IC303 microcontroller becomeslower.

② The driver connected to the lower discharge terminal (from the Q318 to Q325/H board) for relays (from the RY301 to RY308/H board) is turned off.

③ The relay connected to the turned-off driver is turned off and the constant-current discharge circuit including the fan FM301 stops.

Performance of Refresh discharge setting operation

① Press the unlit refresh button (SW305/G board) for more than 50m seconds.

② The low voltage (0V) is input to the refresh discharge setting/cancelling terminal (pin 41) and the refresh discharge operation is performed for a battery in the battery charger.

However, for the following batteries, the refresh discharge is not performed.

- Battery under the boosting-charge finish operation
- Battery which has undergone the boosting-charge ON operation for three minutes and more
- Battery under the discharging finish operation

Performance of Refresh discharge cancelling operation

① Press the lit refresh button (SW305/G board) for more than 50m seconds.

⬇

② The low voltage (0V) is input to the refresh discharge setting/cancelling terminal (pin 41) and the refresh discharge operation is not performed for a battery in the battery charger.

For the discharge finish operation, the trickle charge ON operation and the discharge finish indication are performed.
If the boosting-charge operation is started, the trickle charge OFF operation is performed and the discharge finish indication is stopped.

Performance of Refresh discharge operation

- The discharge ON operation and the indication during discharging are performed.
  If the performance lasts longer than about 10 hours, the discharge OFF operation and the NG indication are performed.
- From the CH5 to CH8
  Any of discharge terminals (from the pin 21 to pin 24) for from the CH5 to CH8 of the IC303 microcontroller becomes high (+5V).
  ⬇
  The transistors Q328 and Q327 on the A board are turned on, via the diodes D313 to D316 on the H board. The reference voltage at the discharge current control block is boosted.
  ⬇
  The discharge current is increased. (1.1A → 2.0A)

Performance of Discharging stop voltage detection

① The discharging stop voltage detection is started after one secondfrom the beginning of the refresh discharge operation.
② With the battery voltage of less than about 10.3V, the low voltage (0V) is output from the operational amplifier (IC302/H board) detecting the battery voltage.
③ The low voltage is input to the pin 31 discharging stop voltage detection terminal of the microcontroller IC303/H board and the discharge OFF operation and discharge finish operation are performed.

SECTION 3
ALIGNMENT

3-1. BOOSTING-CHARGE CURRENT ADJUSTMENT

Equipment: DC ammeter
Preparation:
- Connect the variable load unit (figure 3-1) to jack on the BC-410/410CE front panel.

Adjusting point: ⊘ VR102/A board (HB01271A)
Specification: Output current = 2.5 ± 0.1 Adc

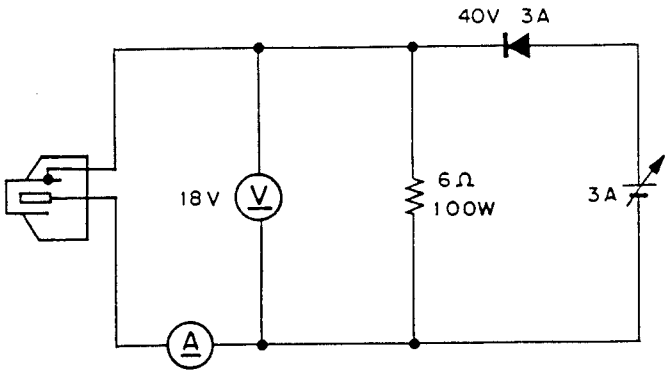


Fig. 3-1

3-2. UPPER-VOLTAGE DETECTION VOLTAGE ADJUSTMENT

Equipment: DC ammeter
Preparation:
1. Connect the variable load unit (figure 3-1) to jack on the BC-410/410CE front panel.
2. ⊘ VR101/A board → Fully clockwise ○ (HB01271A)
3. Set the DC voltage of variable load unit to 19.3 Vdc.

Adjusting point: ⊘ VR101/A board (HB01271A)

Adjustment Procedure
- Turn ⊘ VR101 counterclockwise ○ slowly and stop where the boosting-charge current starts to decrease.

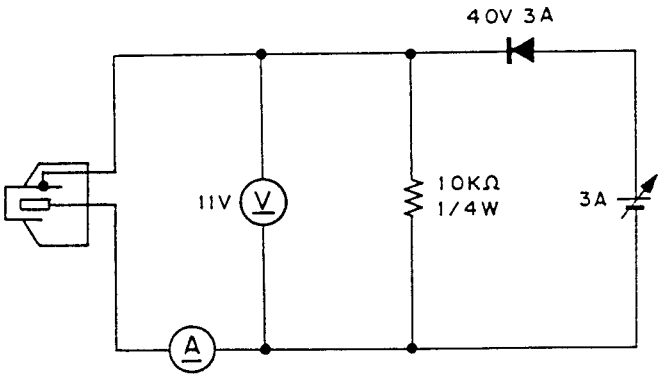


Fig. 3-2

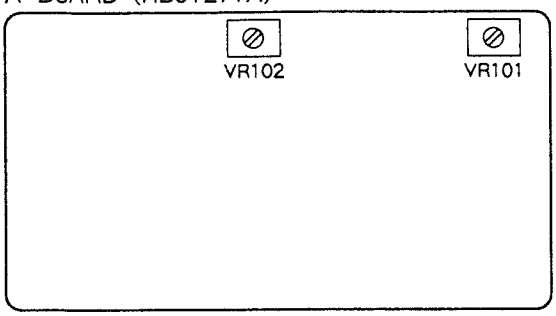
3-3. DISCHARGING STOP VOLTAGE ADJUSTMENT

Equipment: DC ammeter
Preparation:
1. ⊘ VR301/H board → Fully counterclockwise ○ (HB01271H)
2. Push the REFRESH button so that its lamp goes on.
3. Connect the variable load unit (figure 3-2) to jack on the BC-410/410CE front panel.
4. Set the DC voltage of variable load unit to 10.3 Vdc.

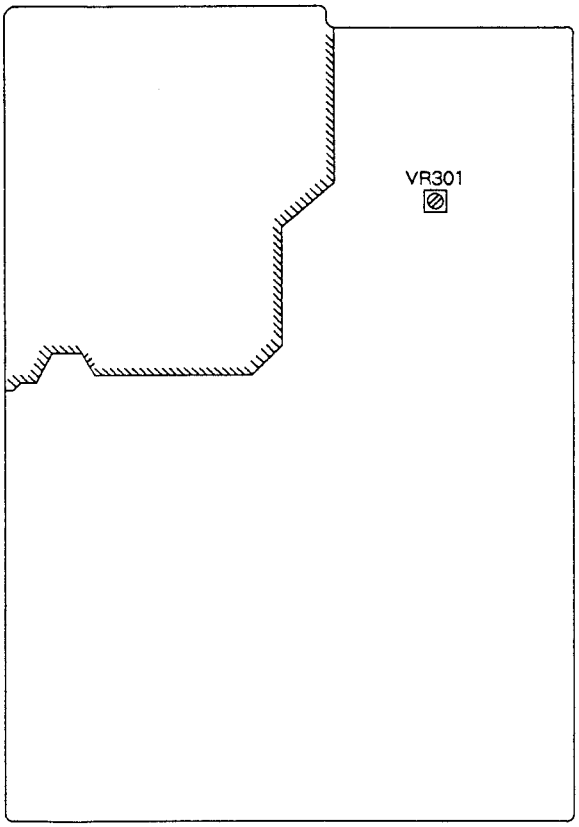
Adjusting point: ⊘ VR301/H board (HB01271H)

Adjustment Procedure
- Turn ⊘ VR301 clockwise ○ slowly and stop where the discharging current just stops.

A BOARD (HB01271A)

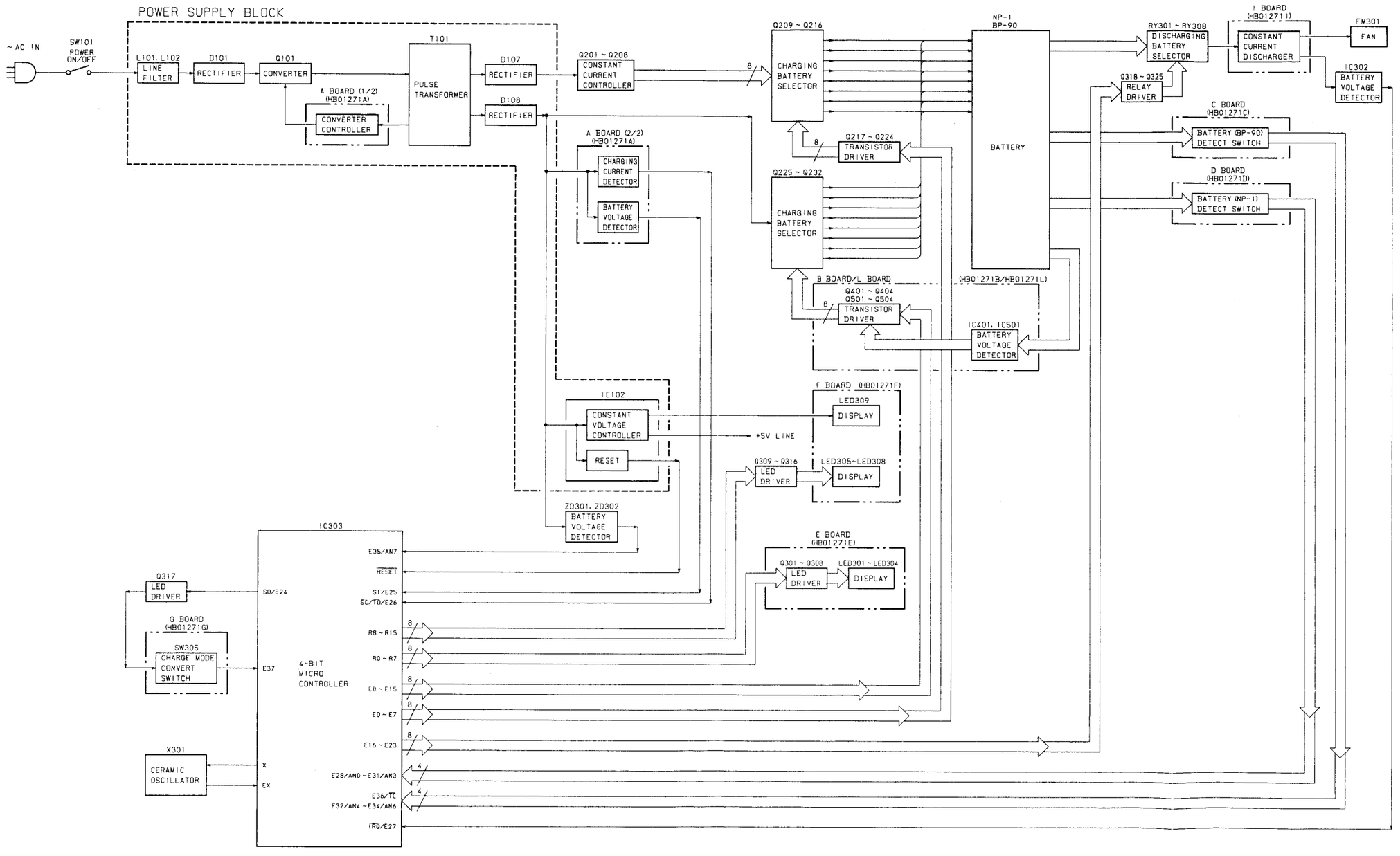


H BOARD (HB01271H)



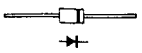
SECTION A
BLOCK DIAGRAM

OVERALL BLOCK

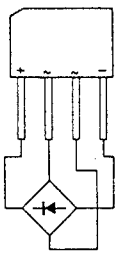


OVERALL BLOCK
BC-410 (J, UC)
BC-410CE (EK)

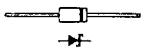
SECTION B
SEMICONDUCTOR



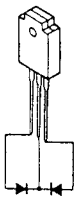
1SS119
ERA22-02
ERB44- ? ?
MA165
MA166
RU3AM



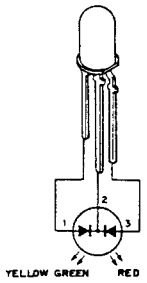
D3SB60



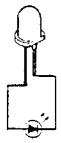
ERA82-004



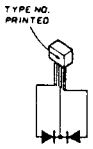
ESAC92M-02



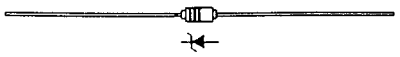
GL-5ED5



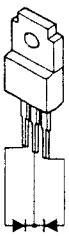
GL-5EG521-B ; YELLOW GREEN



MA175WK

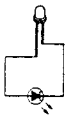


MA4047 (N)-L
MA4056
MA4075 (N)
MA4220-M
MA4300-L

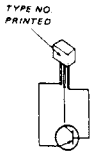


MA752A

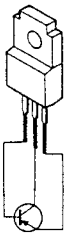
TLG113A ; GREEN



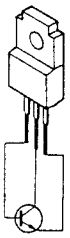
TLGC135AP ; GREEN



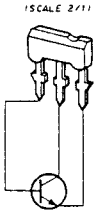
2SA1310



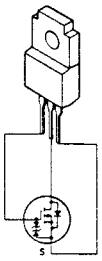
2SB1393



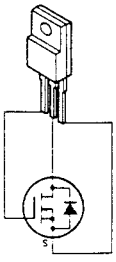
2SD1273



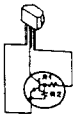
2SD973A



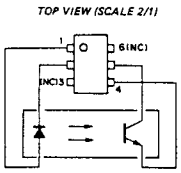
2SJ176



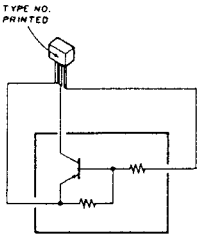
2SK1217



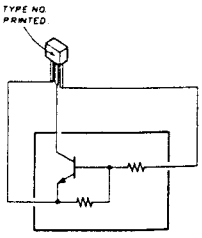
DTC114YS (R1 = 10K, R2 = 47K)



PC111



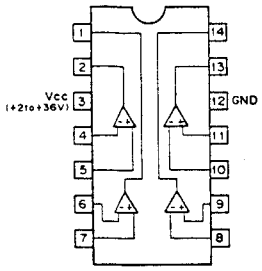
UN4111
UN411L



UN4211
UN4222

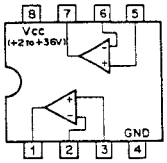
AN1339 (MATSUSHITA)
BA10339 (ROHM)

QUAD COMPARATOR
– TOP VIEW –



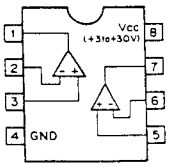
AN1393 (MATSUSHITA)
BA10393 (ROHM)

DUAL VOLTAGE COMPARATORS
– TOP VIEW –



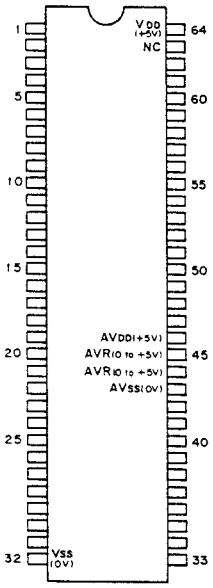
AN6562 (MATSUSHITA)
BA10358 (LOHM)
LM358N (NS)

DUAL OPERATIONAL AMPLIFIERS
– TOP VIEW –

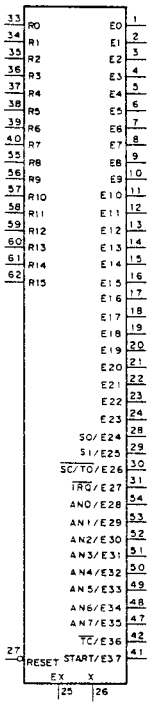


HA012640A (MATSUSHITA)

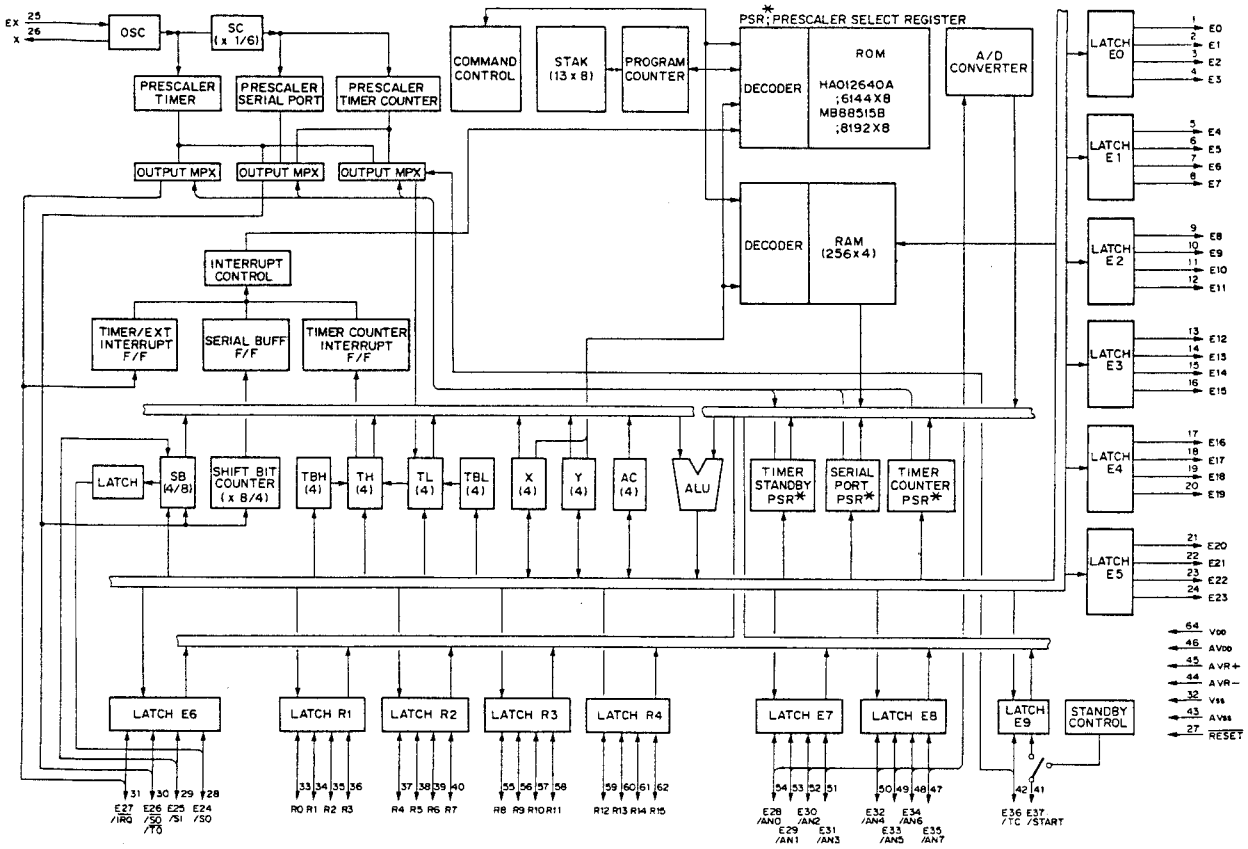
C-MOS 4 BIT ONE-CHIP MICROCONTROLLER WITH MULTI I/O AND
8 BIT A/D CONVERTER
– TOP VIEW –



PIN NO	IN	OUT	SYMBOL	PIN NO	IN	OUT	SYMBOL
1		○	E0	33		○	R0
2		○	E1	34		○	R1
3		○	E2	35		○	R2
4		○	E3	36		○	R3
5		○	E4	37		○	R4
6		○	E5	38		○	R5
7		○	E6	39		○	R6
8		○	E7	40		○	R7
9		○	E8	41		○	E37/START
10		○	E9	42		○	E36/$\overline{TC}$
11			E10	43			AVss
12			E11	44			AVR−
13			E12	45			AVR+
14			E13	46			AVDD
15		○	E14	47		○	E35/AN7
16		○	E15	48		○	E34/AN6
17		○	E16	49		○	E33/AN5
18		○	E17	50		○	E32/AN4
19		○	E18	51		○	E31/AN3
20		○	E19	52		○	E30/AN2
21		○	E20	53		○	E29/AN1
22		○	E21	54		○	E28/AN0
23		○	E22	55		○	R8
24		○	E23	56		○	R9
25	○		EX	57		○	R10
26		○	X	58		○	R11
27	○	○	$\overline{RESET}$	59		○	R12
28		○	E24/SO	60		○	R13
29	○	○	E25/SI	61		○	R14
30	○	○	E26/$\overline{SC/TO}$	62		○	R15
31	○	○	E27/$\overline{IRQ}$	63	—	—	——
32	○		VSS	64			VDD

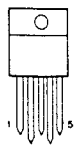


AN0-AN3; ANALOG INPUT PORT IN
AN4-AN7; ANALOG INPUT PORT IN OR
HIGH IMPEDANCE ANALOG INPUT PORT IN
E0-E24 ; I/O PORT (E PORT) OUT
E25-E37; I/O PORT (E PORT) IN/OUT
EX ; EXTERNAL CLOCK IN
IRQ ; EXTERNAL INTERRUPT REQUEST IN (↓)
R0-R15 ; I/O PORT (R PORT) IN/OUT
RESET ; RESET IN/OUT
SC/TO ; SHIFT CLOCK IN/TIMING OUT
SI ; SERIAL DATA IN
SO ; SERIAL DATA OUT
START ; START IN/OUT
TC ; EXTERNAL CLOCK IN FOR COUNTER (↓)
X ; CLOCK OUT

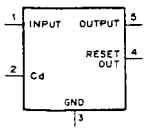


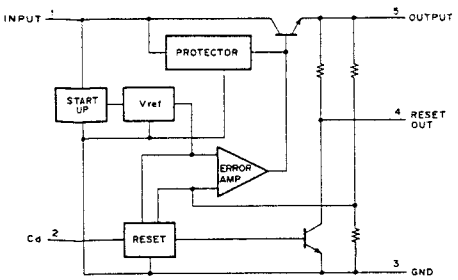
L78MR05 (SANYO)

POSITIVE VOLTAGE REGULATOR (0.5A)
– PRINTED SIDE VIEW –



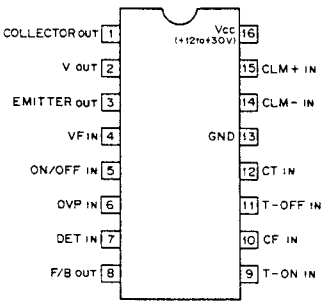
OUTPUT VOLTAGE	L78MR ??
+ 5V	L78MR05
+ 6V	L78MR06
+ 8V	L78MR08
+ 9V	L78MR09
+ 12V	L78MR12

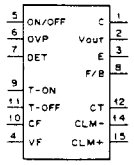


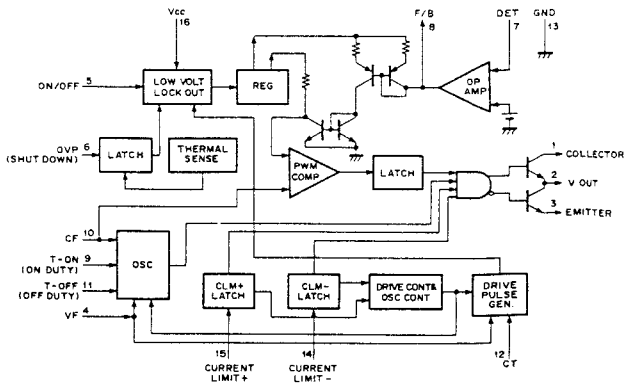


M51977P (MITSUBISHI)

SWITCHING REGULATOR CONTROL
– TOP VIEW –

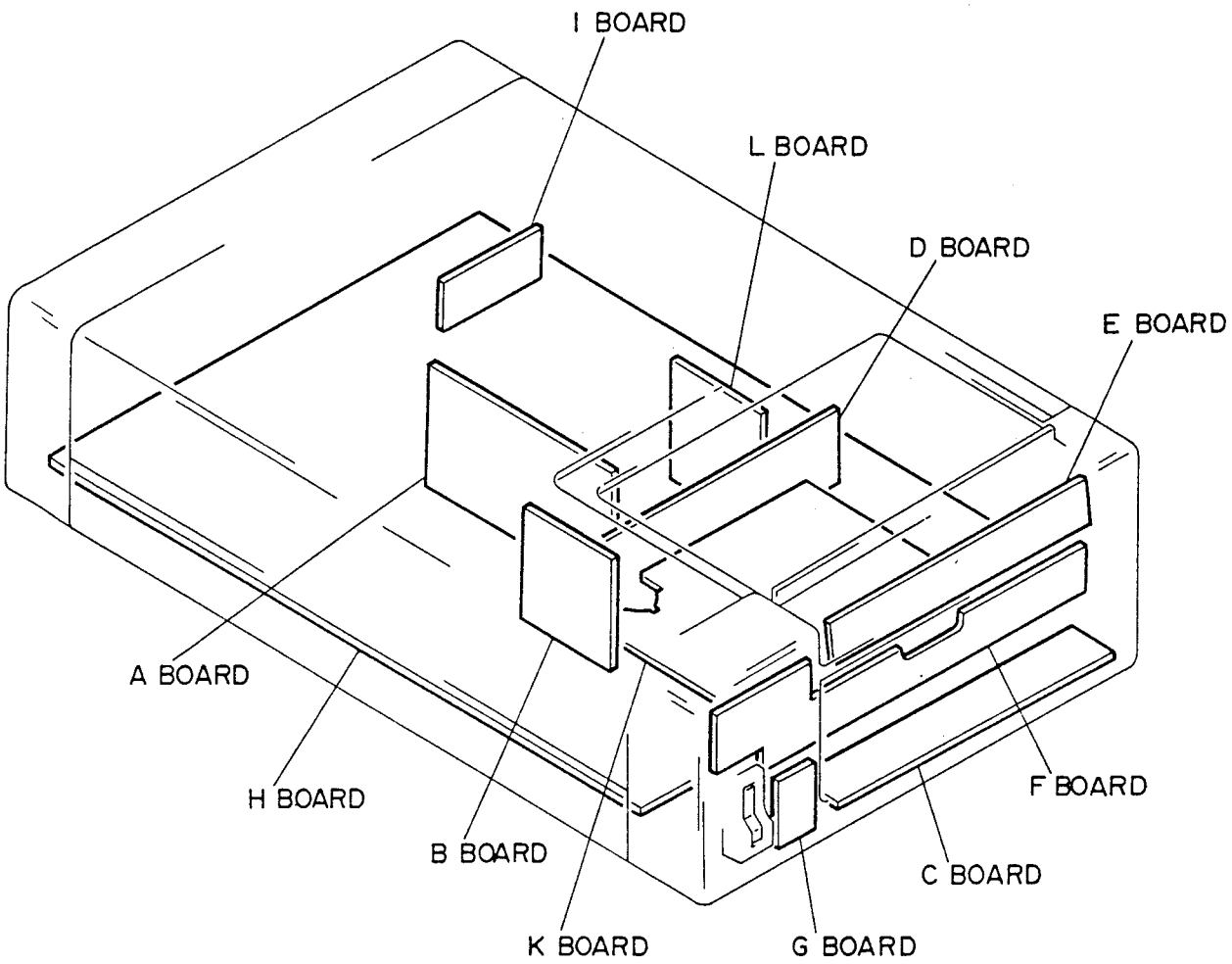






SECTION C
SCHEMATIC DIAGRAMS AND BOARD ILLUSTRATIONS

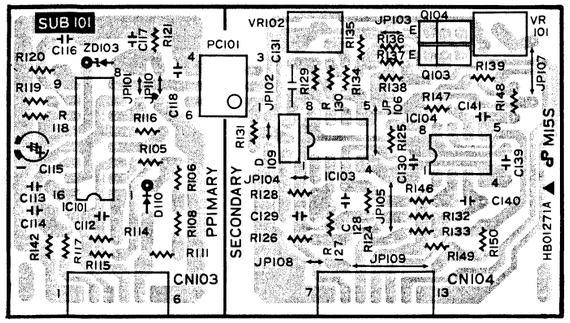
BOARD LAYOUT



FRAME A, B, C, D, E, F, G, H, I, K, L

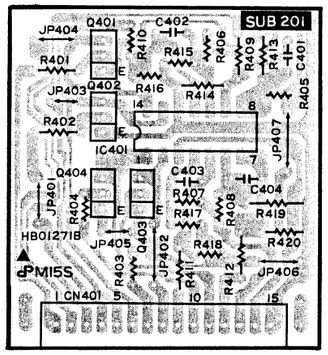
FRAME

A BOARD (HB01271A)



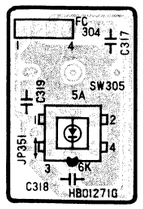
COMPONENT SIDE

B BOARD (HB01271B)



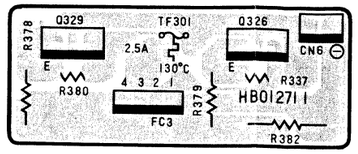
COMPONENT SIDE

G BOARD (HB01271G)



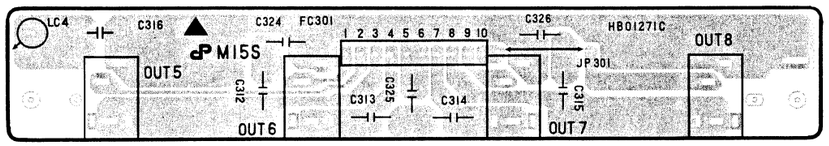
COMPONENT SIDE

I BOARD (HB01271I)



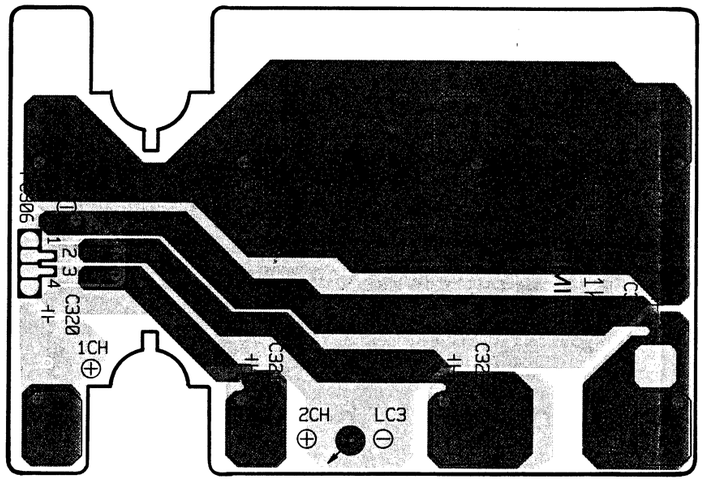
COMPONENT SIDE

C BOARD (HB01271C)



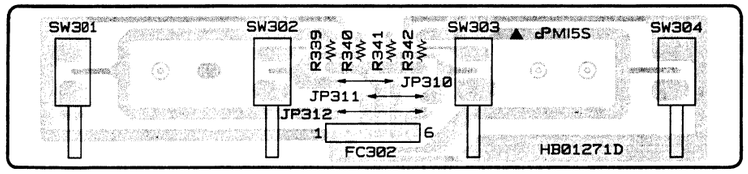
COMPONENT SIDE

K BOARD (HB01271K)



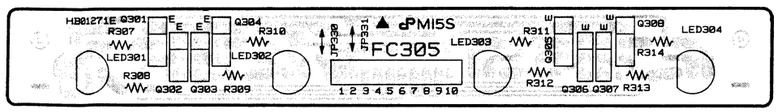
COMPONENT SIDE

D BOARD (HB01271D)



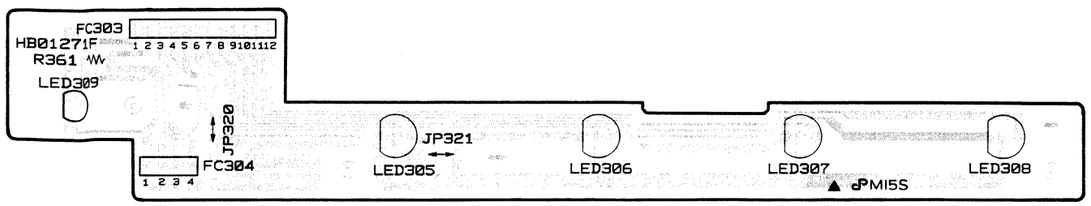
COMPONENT SIDE

E BOARD (HB01271E)



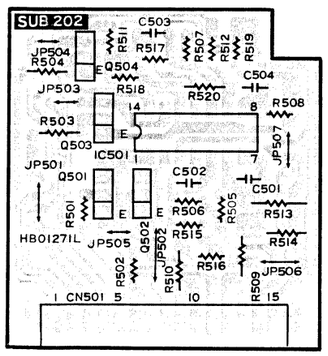
COMPONENT SIDE

F BOARD (HB01271F)



COMPONENT SIDE

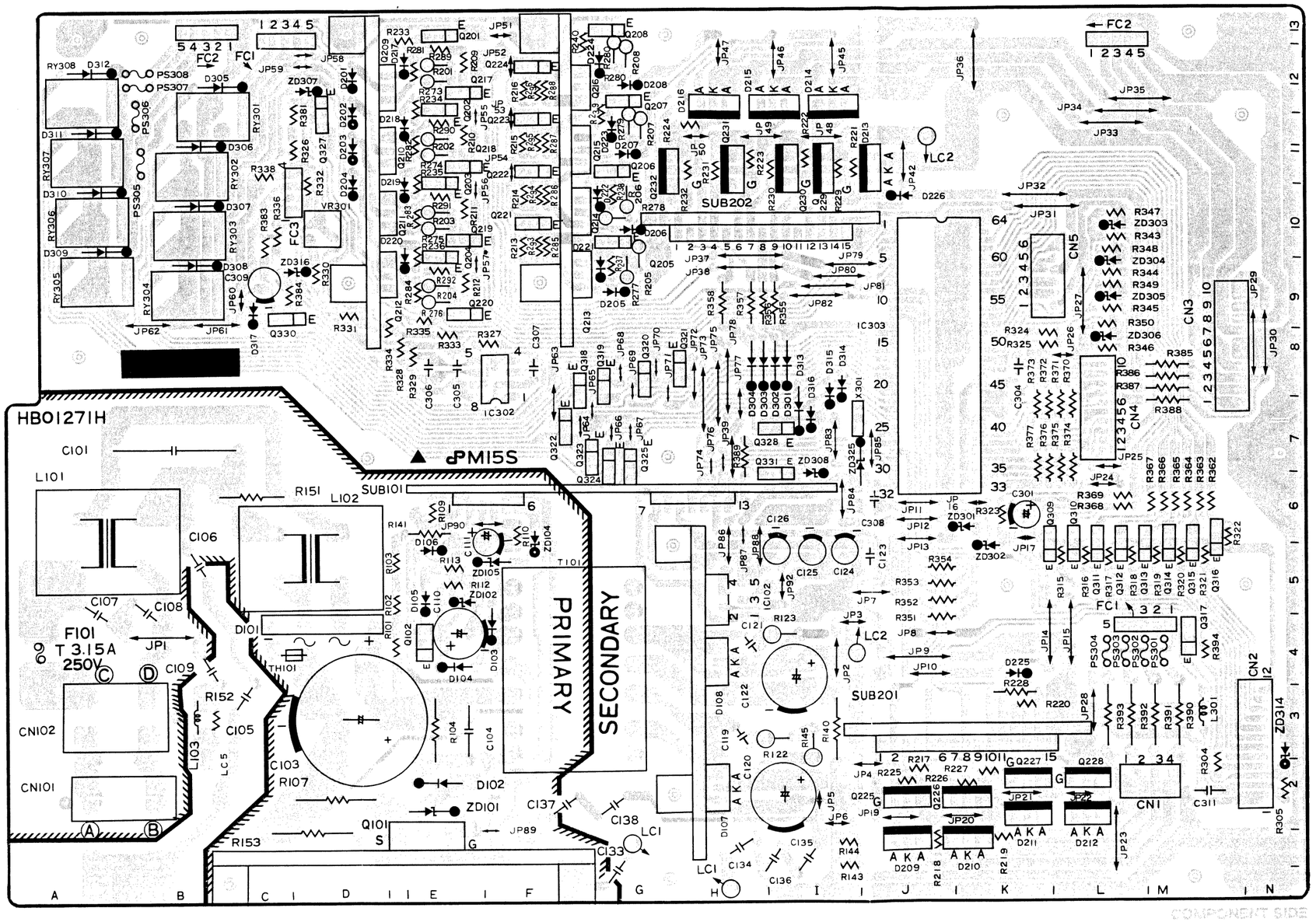
L BOARD (HB01271L)



COMPONENT SIDE

H BOARD

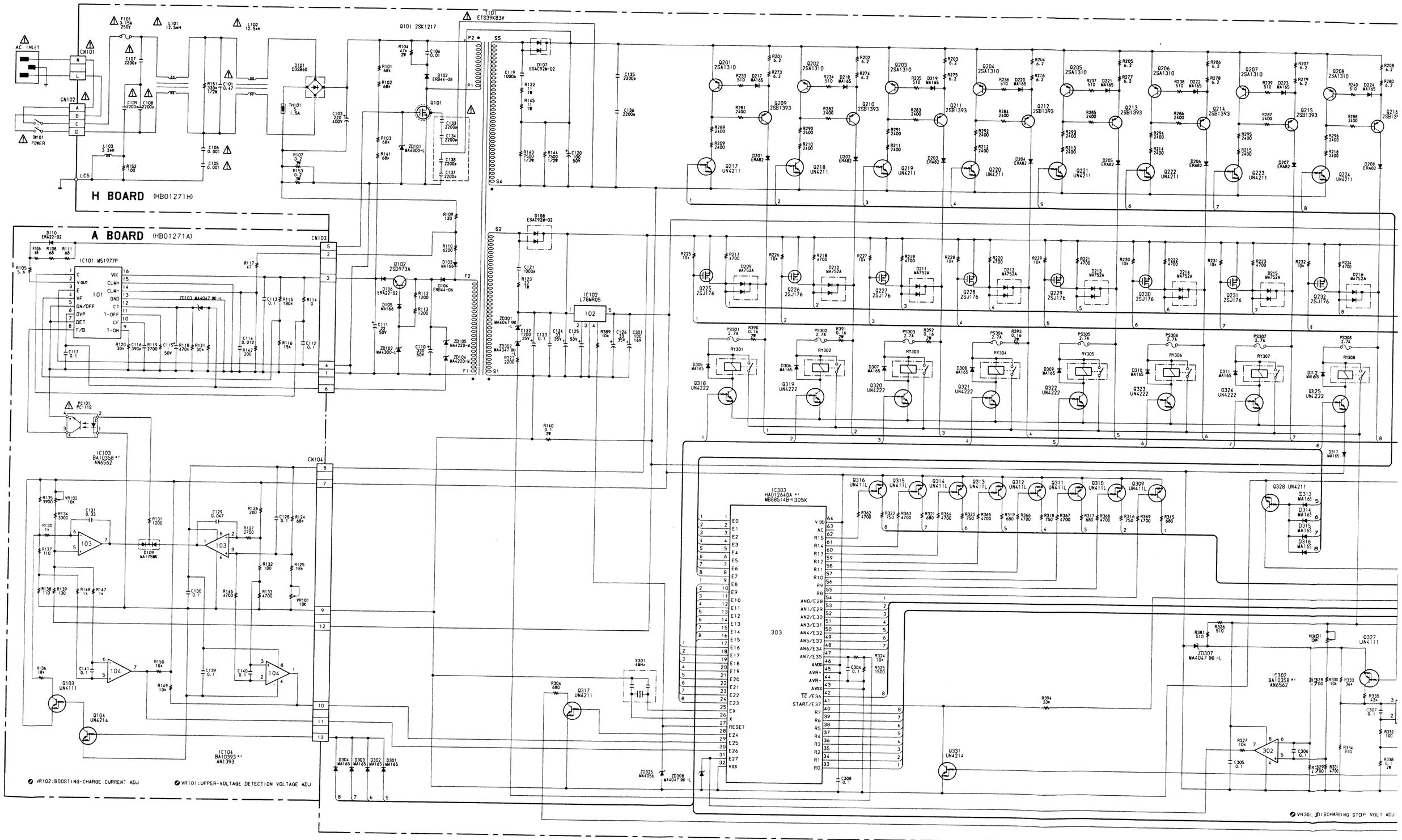
H BOARD (HB01271H)

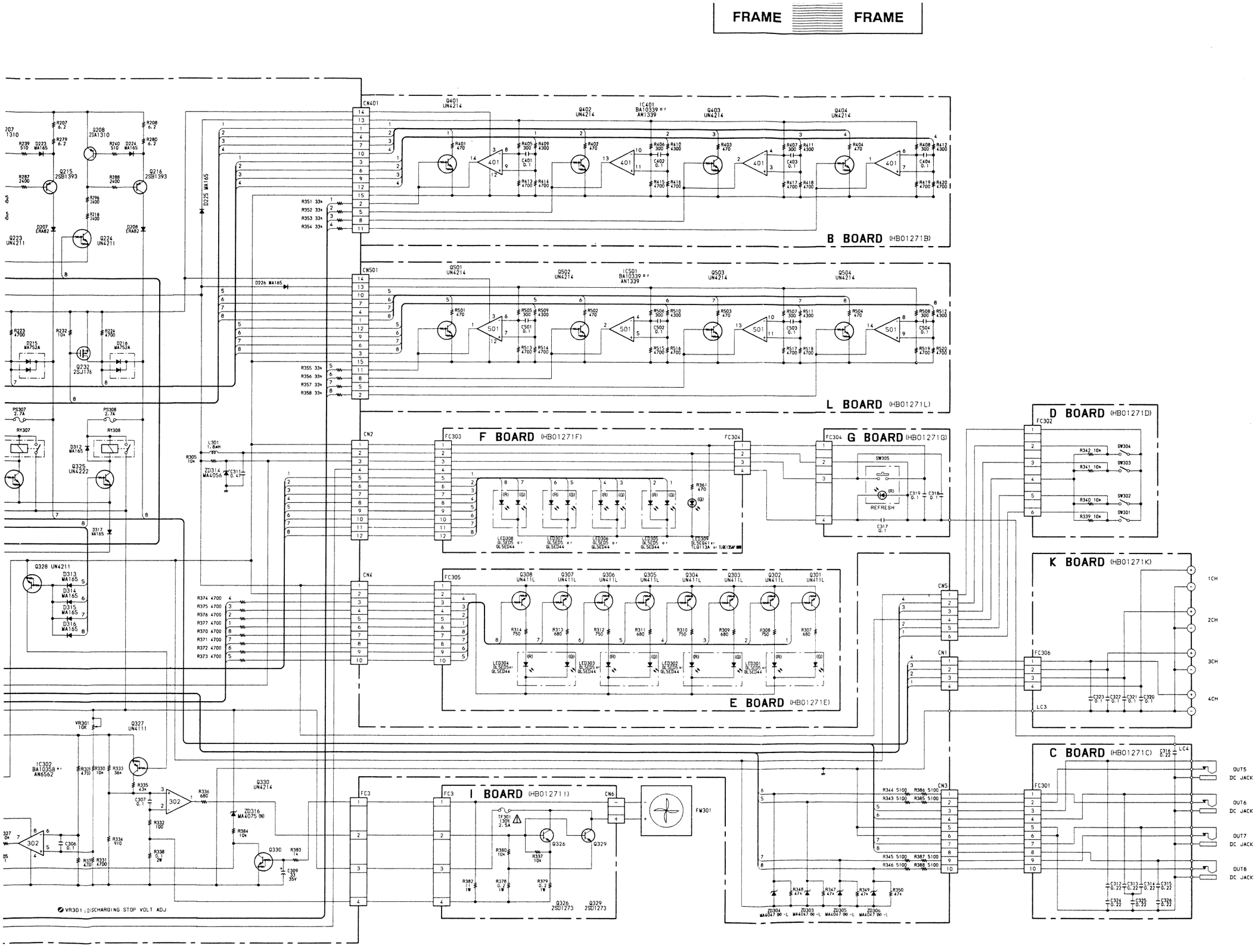


H BOARD (HB01271H)

CN1	M-2	ZD101	E-2	Q226	K-2
CN2	N-3	ZD102	E-5	Q227	K-2
CN3	M-8	ZD104	F-6	Q228	L-2
CN4	L-7	ZD105	F-5	Q229	I-11
CN5	K-9	ZD301	K-6	Q230	I-11
CN101	B-2	ZD302	K-6	Q231	H-11
CN102	A-3	ZD303	L-10	Q232	G-11
		ZD304	L-9	Q309	K-6
D101	D-4	ZD305	L-9	Q310	L-6
D102	E-2	ZD306	L-8	Q311	L-6
D103	F-4	ZD307	D-12	Q312	L-6
D104	E-4	ZD308	I-7	Q313	M-6
D105	E-5	ZD314	N-3	Q314	M-6
D106	E-6	ZD316	D-9	Q315	M-6
D107	H-2	ZD325	J-7	Q316	M-6
D108	H-4			Q317	M-4
D201	D-12	F101	A-4	Q318	F-8
D202	D-12			Q319	G-8
D203	D-11	IC102	H-5	Q320	G-8
D204	D-11	IC302	F-8	Q321	H-8
D205	G-9	IC303	J-8	Q322	F-7
D206	G-10			Q323	G-7
D208	G-12	PS301	M-4	Q324	G-7
D209	J-1	PS302	L-4	Q325	G-7
D210	K-1	PS303	L-4	Q327	D-12
D211	K-2	PS304	L-4	Q328	I-7
D212	L-2	PS305	B-11	Q330	C-9
D213	J-11	PS306	B-12	Q331	I-7
D214	I-12	PS307	B-12		
D215	I-12	PS308	B-12	RY301	B-12
D216	H-12			RY302	B-11
D217	E-12	Q101	E-2	RY303	B-10
D218	E-11	Q102	E-4	RY304	B-9
D219	E-11	Q201	E-13	RY305	A-9
D220	E-10	Q202	E-12	RY306	A-10
D221	G-9	Q203	E-11	RY307	A-11
D222	G-10	Q204	E-10	RY308	A-12
D223	G-11	Q205	G-10		
D224	G-12	Q206	G-11	T101	F-4
D225	K-4	Q207	G-12		
D226	J-10	Q208	G-13	TH101	D-4
D301	I-8	Q209	E-12		
D302	I-8	Q210	E-11	VR301	D-10
D303	H-8	Q211	E-10		
D304	H-8	Q212	E-9	X301	J-7
D305	C-12	Q213	G-9		
D306	B-11	Q214	G-10		
D307	B-10	Q215	G-11		
D308	B-10	Q216	G-12		
D309	A-10	Q217	E-12		
D310	A-11	Q218	E-11		
D311	A-11	Q219	E-10		
D312	A-12	Q220	E-9		
D313	I-7	Q221	F-10		
D314	I-8	Q222	F-11		
D315	I-8	Q223	F-12		
D316	I-7	Q224	F-12		
D317	C-9	Q225	J-2		

FRAME


H BOARD (HB01271H)
A BOARD (HB01271A)
AC INLET
CN101
CN102
SW101 POWER
F101 3.15A 250V
L101 12.5mH
L102 12.5mH
T101 ETS39K83V
Q101 2SK1217
D101 D3SB60
TH101 5 1.5A
IC101 MS1977P
IC102 L78MR05
IC103 BA10358 */ AN6562
IC104 BA10393 */ AN1393
IC303 HA012640A **/ MB88514B-130SK
Q201 2SA1310
Q209 2SB1393
Q217 UN4211
Q225 2SJ176
PS301 2.7A
RY301
Q318 UN4222
Q316 UN411L
Q328 UN4211
Q103 UN4111
Q104 UN4214
Q317 UN4211
Q331 UN4214
Q327 UN4111
X301 4MHz
VR102:BOOSTING-CHARGE CURRENT ADJ
VR101:UPPER-VOLTAGE DETECTION VOLTAGE ADJ
VR301:DISCHARGING STOP VOLT ADJ



FRAME WIRING

- A BOARD (HB01271A)
- B BOARD (HB01271B)
- C BOARD (HB01271C)
- D BOARD (HB01271D)
- E BOARD (HB01271E)
- F BOARD (HB01271F)
- G BOARD (HB01271G)
- H BOARD (HB01271H)
- I BOARD (HB01271I)
- K BOARD (HB01271K)
- L BOARD (HB01271L)

BC-410 (J, UC)
BC-410CE (EK)

SECTION D
SPARE PARTS

PARTS INFORMATION

1. **Safety Related Component Warning**

   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose parts numbers appear as shown in this manual or in service manual supplements published by Sony.

2. Replace parts that are supplied from Sony Parts Center can sometimes have different shape and external appearance than what are actually used in equipment. This is due to"accommodating the improved parts and/or engineering changes" or"standardization of genuine parts."
   - This manual's exploded view and electrical spare parts lists are indicating the parts numbers of "the standardized genuine parts at present."
   - Regarding engineering parts and diagrams changes in our engineering department, refer to Sony service bulletins and service manual supplements.

3. The parts marked with"S" in the SP column of the exploded views and electrical spare parts list are normally required for routine service work. Orders for parts marked with "O" will be processed, but allow for additional delivery time.

4. Item with no parts number and/or no description are not stocked because they are seldom required for routine service.

5. **Abbreviation**

REF. No.	DESCRIPTION	REF. No.	DESCRIPTION	REF. No.	DESCRIPTION
BT	BATTERY	FB	FERRITE BEAD	RV	VARIABLE RESISTOR
BZ	BUZZER	FL	FILTER	RY	RELAY
C	CAPACITOR	IC	IC	S	SWITCH
CN	CONNECTOR	L	INDUCTOR	T	TRANSFORMER
CP	COMBINATION PARTS	LV	VARIABLE INDUCTOR	TH	THERMISTOR
CV	VARIABLE CAPACITOR	Q	TRANSISTOR	TM	TIMER
D	DIODE	R	RESISTOR	VDR	VARISTOR
DL	DELAY LINE	RB	RESISTOR BLOCK	X	OSCILLATOR

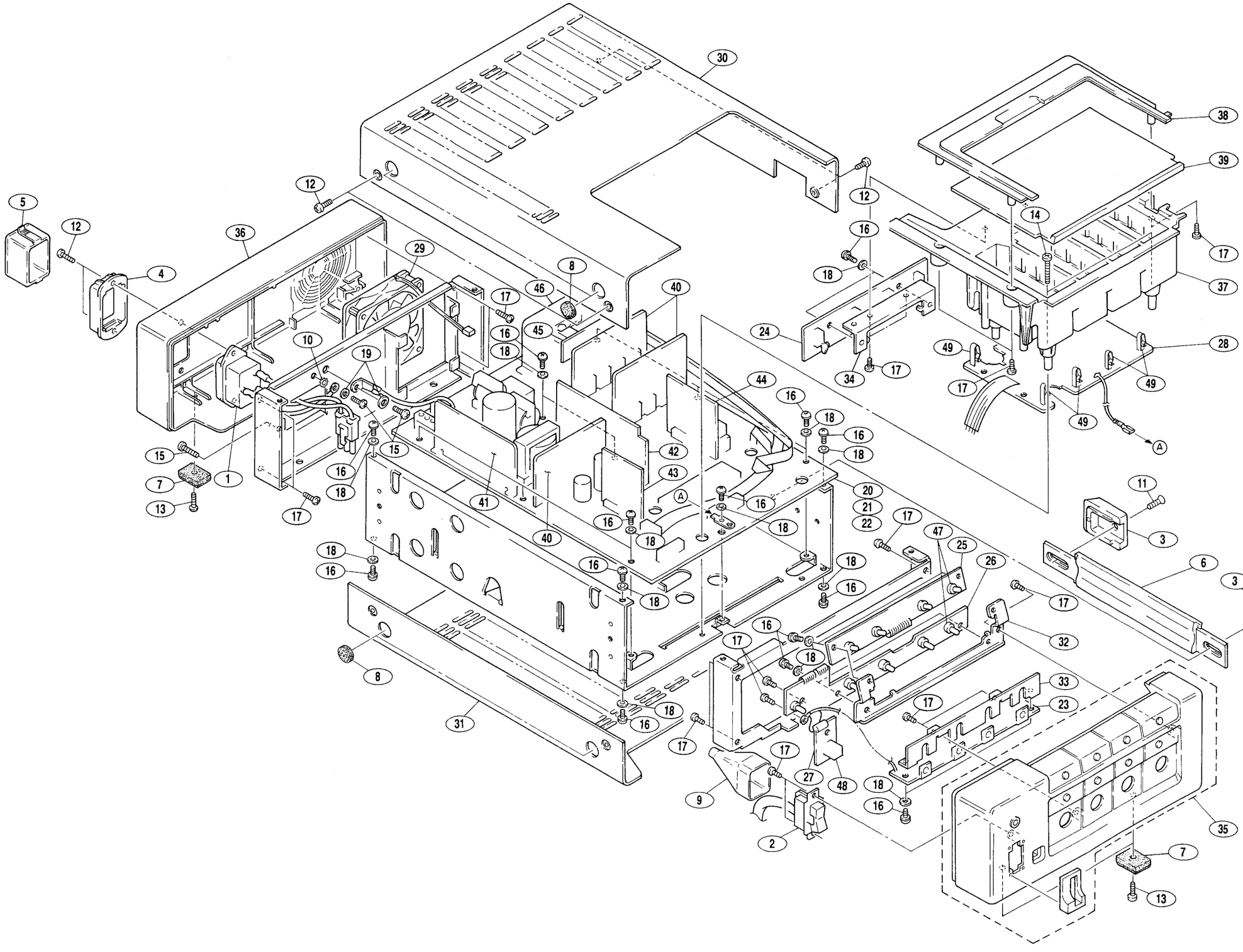
All capacitors are in micro farads unless otherwise specified.
All inductors are in micro henries unless otherwise specified.
All resistors are in ohms.

EXPLODED VIEW

OVERALL BLOCK

No.	Part No.	SP	Description
1	⚠ 1-580-375-11	o	INLET 3P
2	⚠ 1-570-743-21	s	SWITCH, AC POWER
3	2-253-301-00	o	TABLE, HANDLE
4	2-990-241-01	o	HOLDER (A), PLUG
5	2-990-242-01	o	HOLDER (B), PLUG
6	3-419-372-01	s	HANDLE
7	3-693-297-01	s	FOOT, RUBBER, RADIATION
8	3-723-097-01	o	FOOT, RUBBER
9	4-025-191-00	o	COVER, INSULATING, SWITCH
10	7-623-310-07	s	LW, TYPE A
11	7-682-264-09	s	SCREW +K 4x14
12	7-682-548-09	s	SCREW +B 3x8
13	7-682-551-09	s	SCREW +B 3x14
14	7-682-553-09	s	SCREW +B 3x20
15	7-682-562-04	s	SCREW +P 4x10
16	7-682-648-09	s	SCREW +PS 3x8
17	7-685-146-11	s	SCREW +PTP 3x8
18	7-688-003-01	s	W3, SMALL
19	7-688-004-01	s	W4, SMALL
20	9-998-030-01	o	MOUNTED CIRCUIT BOARD, H (J)
21	9-998-031-01	o	MOUNTED CIRCUIT BOARD, H (UC)
22	9-998-032-01	o	MOUNTED CIRCUIT BOARD, H (EK)
23	9-998-033-01	o	MOUNTED CIRCUIT BOARD, C
24	9-998-034-01	o	MOUNTED CIRCUIT BOARD, D
25	9-998-035-01	o	MOUNTED CIRCUIT BOARD, E
26	9-998-036-01	o	MOUNTED CIRCUIT BOARD, F
27	9-998-037-01	o	MOUNTED CIRCUIT BOARD, G
28	9-998-038-01	o	MOUNTED CIRCUIT BOARD, K
29	9-998-053-01	s	FAN
30	9-998-057-01	o	UPPER COVER
31	9-998-058-01	o	LOWER COVER
32	9-998-062-01	o	BRACKET, LED
33	9-998-063-01	o	BRACKET, JACK
34	9-998-064-01	o	BRACKET, SWITCH
35	9-998-065-01	o	PANEL ASSY, FRONT
36	9-998-066-01	o	PANEL, REAR
37	9-998-067-01	o	CASE, BATTERY
38	9-998-068-01	o	UPPER PANEL
39	9-998-069-01	o	LID, BATTERY
40	9-998-093-01	o	HEATSINK 3
41	9-998-094-01	o	HEATSINK 4
42	9-998-099-01	o	MOUNTED CIRCUIT BOARD, A
43	9-998-103-01	o	MOUNTED CIRCUIT BOARD, B
44	9-998-104-01	o	MOUNTED CIRCUIT BOARD, L
45	9-998-130-01	o	MOUNTED CIRCUIT BOARD, I
46	9-998-151-01	o	HEATSINK 1
47	9-998-164-01	o	HOLDER, LED
48	9-998-167-01	s	SWITCH ASSY
49	9-998-174-01	s	BATTERY TERMINAL

OVERALL BLOCK



ELECTRICAL PARTS LIST

A BOARD (HB01271A)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-099-01	o	MOUNTED CIRCUIT BOARD, A
C112	1-136-165-00	s	FILM 0.1MF 5% 50V
C113	1-136-165-00	s	FILM 0.1MF 5% 50V
C114	1-130-484-00	s	MYLAR 0.012MF 5% 50V
C115	1-126-160-11	s	ELECT 1MF 20% 50V
C116	1-102-113-00	s	CERAMIC 390PF 10% 50V
C117	1-136-165-00	s	FILM 0.1MF 5% 50V
C128	1-136-165-00	s	FILM 0.1MF 5% 50V
C129	1-130-491-00	s	MYLAR 0.047MF 5% 50V
C130	1-136-165-00	s	FILM 0.1MF 5% 50V
C131	1-136-171-00	s	FILM 0.33MF 5% 50V
C139	1-136-165-00	s	FILM 0.1MF 5% 50V
C140	1-136-165-00	s	FILM 0.1MF 5% 50V
C141	1-136-165-00	s	FILM 0.1MF 5% 50V
CN103	9-998-137-01	o	CONNECTOR 6P, MALE
CN104	9-998-138-01	o	CONNECTOR 7P, MALE
D109	9-998-132-01	s	DIODE MA175WK
D110	9-998-082-01	s	DIODE ERA22-02
IC101	9-998-136-01	s	IC M51977P
IC103	8-759-008-70	s	IC LM358N
IC104	8-759-987-91	s	IC BA10393
PC101	⚠9-998-135-01	s	PHOTOCOUPLER PC111
Q103	8-729-422-57	s	TRANSISTOR UN4111
Q104	8-729-904-36	s	TRANSISTOR DTC114YS
R105	1-249-390-11	s	CARBON 5.6 5% 1/4W
R106	1-249-403-11	s	CARBON 68 5% 1/4W
R108	1-249-403-11	s	CARBON 68 5% 1/4W
R111	1-249-403-11	s	CARBON 68 5% 1/4W
R115	1-247-885-00	s	CARBON 180K 5% 1/4W
R116	1-249-431-11	s	CARBON 15K 5% 1/4W
R117	1-249-401-11	s	CARBON 47 5% 1/4W
R118	1-247-895-00	s	CARBON 470K 5% 1/4W
R119	1-249-422-11	s	CARBON 2.7K 5% 1/4W
R120	1-247-866-11	s	CARBON 30K 5% 1/4W
R121	1-247-866-11	s	CARBON 30K 5% 1/4W
R124	1-249-439-11	s	CARBON 68K 5% 1/4W
R125	1-249-432-11	s	CARBON 18K 5% 1/4W
R126	1-247-814-11	s	CARBON 200 5% 1/4W
R127	1-249-422-11	s	CARBON 2.7K 5% 1/4W
R130	1-249-417-11	s	CARBON 1K 5% 1/4W
R131	1-249-418-11	s	CARBON 1.2K 5% 1/4W
R132	1-249-405-11	s	CARBON 100 5% 1/4W
R133	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R134	1-249-423-11	s	CARBON 3.3K 5% 1/4W
R135	1-249-424-11	s	CARBON 3.9K 5% 1/4W
R136	1-249-432-11	s	CARBON 18K 5% 1/4W
R137	1-247-808-11	s	CARBON 110 5% 1/4W
R138	1-247-808-11	s	CARBON 110 5% 1/4W
R139	1-247-810-11	s	CARBON 130 5% 1/4W
R142	1-247-814-11	s	CARBON 200 5% 1/4W
R146	1-249-425-11	s	CARBON 4.7K 5% 1/4W

(A BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R147	1-249-417-11	s	CARBON 1K 5% 1/4W
R148	1-249-417-11	s	CARBON 1K 5% 1/4W
R149	1-249-429-11	s	CARBON 10K 5% 1/4W
R150	1-249-429-11	s	CARBON 10K 5% 1/4W
VR101	9-998-131-01	s	RES, ADJ, METAL 10K
VR102	9-998-131-01	s	RES, ADJ, METAL 10K
ZD103	9-998-110-11	s	DIODE MA4047(N)-L

B BOARD (HB01271B)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-103-01	o	MOUNTED CIRCUIT BOARD, B
C401	1-136-165-00	s	FILM 0.1MF 5% 50V
C402	1-136-165-00	s	FILM 0.1MF 5% 50V
C403	1-136-165-00	s	FILM 0.1MF 5% 50V
C404	1-136-165-00	s	FILM 0.1MF 5% 50V
CN401	9-998-142-01	o	CONNECTOR 15P, MALE
IC401	9-998-141-01	s	BA10339 or AN1339
Q401	8-729-904-36	s	TRANSISTOR DTC114YS
Q402	8-729-904-36	s	TRANSISTOR DTC114YS
Q403	8-729-904-36	s	TRANSISTOR DTC114YS
Q404	8-729-904-36	s	TRANSISTOR DTC114YS
R401	1-249-413-11	s	CARBON 470 5% 1/4W
R402	1-249-413-11	s	CARBON 470 5% 1/4W
R403	1-249-413-11	s	CARBON 470 5% 1/4W
R404	1-249-413-11	s	CARBON 470 5% 1/4W
R405	1-247-818-11	s	CARBON 300 5% 1/4W
R406	1-247-818-11	s	CARBON 300 5% 1/4W
R407	1-247-818-11	s	CARBON 300 5% 1/4W
R408	1-247-818-11	s	CARBON 300 5% 1/4W
R409	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R410	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R411	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R412	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R413	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R414	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R415	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R416	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R417	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R418	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R419	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R420	1-249-425-11	s	CARBON 4.7K 5% 1/4W

C BOARD (HB01271C)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-033-01	o	MOUNTED CIRCUIT BOARD, C
C312	1-136-169-00	s	FILM 0.22MF 5% 50V
C313	1-136-169-00	s	FILM 0.22MF 5% 50V
C314	1-136-169-00	s	FILM 0.22MF 5% 50V
C315	1-136-169-00	s	FILM 0.22MF 5% 50V
C316	1-136-169-00	s	FILM 0.22MF 5% 50V
C324	1-136-169-00	s	FILM 0.22MF 5% 50V
C325	1-136-169-00	s	FILM 0.22MF 5% 50V
C326	1-136-169-00	s	FILM 0.22MF 5% 50V
FC301	9-998-154-01	o	FLAT CABLE (10 CORE)
LC4	9-998-156-01	o	LEAD CABLE
OUT5	9-998-155-01	s	DC JACK
OUT6	9-998-155-01	s	DC JACK
OUT7	9-998-155-01	s	DC JACK
OUT8	9-998-155-01	s	DC JACK

D BOARD (HB01271D)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-034-01	o	MOUNTED CIRCUIT BOARD, D
FC302	9-998-160-01	o	FLAT CABLE (6 CORE)
R339	1-249-429-11	s	CARBON 10K 5% 1/4W
R340	1-249-429-11	s	CARBON 10K 5% 1/4W
R341	1-249-429-11	s	CARBON 10K 5% 1/4W
R342	1-249-429-11	s	CARBON 10K 5% 1/4W
SW301	9-998-159-01	s	SWITCH
SW302	9-998-159-01	s	SWITCH
SW303	9-998-159-01	s	SWITCH
SW304	9-998-159-01	s	SWITCH

E BOARD (HB01271E)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-035-01	o	MOUNTED CIRCUIT BOARD, E
	9-998-164-01	o	LED HOLDER
FC305	9-998-162-01	o	FLAT CABLE (10 CORE)
LED301	8-719-946-89	s	LED GL5ED5 GRN-RED
LED302	8-719-946-89	s	LED GL5ED5 GRN-RED
LED303	8-719-946-89	s	LED GL5ED5 GRN-RED
LED304	8-719-946-89	s	LED GL5ED5 GRN-RED
Q301	8-729-422-71	s	TRANSISTOR UN411L
Q302	8-729-422-71	s	TRANSISTOR UN411L
Q303	8-729-422-71	s	TRANSISTOR UN411L
Q304	8-729-422-71	s	TRANSISTOR UN411L
Q305	8-729-422-71	s	TRANSISTOR UN411L
Q306	8-729-422-71	s	TRANSISTOR UN411L
Q307	8-729-422-71	s	TRANSISTOR UN411L
Q308	8-729-422-71	s	TRANSISTOR UN411L
R307	1-249-415-11	s	CARBON 680 5% 1/4W
R308	1-247-828-11	s	CARBON 750 5% 1/4W
R309	1-249-415-11	s	CARBON 680 5% 1/4W
R310	1-247-828-11	s	CARBON 750 5% 1/4W
R311	1-249-415-11	s	CARBON 680 5% 1/4W
R312	1-247-828-11	s	CARBON 750 5% 1/4W
R313	1-249-415-11	s	CARBON 680 5% 1/4W
R314	1-247-828-11	s	CARBON 750 5% 1/4W

F BOARD (HB01271F)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-036-01	o	MOUNTED CIRCUIT BOARD, F
	9-998-166-01	o	LED HOLDER
FC303	9-998-165-01	o	FLAT CABLE (12 CORE)
LED305	8-719-946-89	s	LED GL5ED5 GRN-RED
LED306	8-719-946-89	s	LED GL5ED5 GRN-RED
LED307	8-719-946-89	s	LED GL5ED5 GRN-RED
LED308	8-719-946-89	s	LED GL5ED5 GRN-RED
LED309	8-719-907-92	s	LED GL-5EG521-B GRN
R361	1-249-413-11	s	CARBON 470 5% 1/4W

G BOARD (HB01271G)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-037-01	o	MOUNTED CIRCUIT BOARD, G
C317	1-136-165-00	s	FILM 0.1MF 5% 50V
C318	1-136-165-00	s	FILM 0.1MF 5% 50V
C319	1-136-165-00	s	FILM 0.1MF 5% 50V
FC304	9-998-168-01	o	FLAT CABLE (4 CORE)
SW305	9-998-167-01	s	SWITCH Ass'y "REFRESH"

H BOARD (HB01271H)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-030-01	o	MOUNTED CIRCUIT BOARD, H (J)
	9-998-031-01	o	MOUNTED CIRCUIT BOARD, H (UC)
	9-998-032-01	o	MOUNTED CIRCUIT BOARD, H (EK) (INCLUDING A, B AND L BOARDS)
C101	⚠1-136-527-12	s	FILM 0.47MF 20% 250V
C103		s	ELECT 220MF 400V
C104	9-998-076-01	s	FILM 0.01MF 1KV
C105	⚠	s	CERAMIC 0.001MF 250V
C106	⚠	s	CERAMIC 0.001MF 250V
C107	⚠1-161-742-00	s	CERAMIC 0.0022MF 400V
C108	⚠1-161-742-00	s	CERAMIC 0.0022MF 400V
C109	⚠1-161-742-00	s	CERAMIC 0.0022MF 400V
C110	1-124-912-11	s	ELECT 330MF 20% 50V
C111	1-126-233-11	s	ELECT 22MF 20% 50V
C119	9-998-077-01	s	CERAMIC 0.001MF 1KV
C120	1-124-122-11	s	ELECT 100MF 20% 50V
C121	9-998-077-01	s	CERAMIC 0.001MF 1KV
C122		s	ELECT 1200MF 35V
C123	1-136-165-00	s	FILM 0.1MF 5% 50V
C124	1-124-482-11	s	ELECT 33MF 20% 35V
C125	1-126-160-11	s	ELECT 1MF 20% 50V
C126	1-124-482-11	s	ELECT 33MF 20% 35V
C133	⚠1-161-742-00	s	CERAMIC 0.0022MF 20% 400V
C134	⚠1-161-742-00	s	CERAMIC 0.0022MF 20% 400V
C135	1-161-742-00	s	CERAMIC 0.0022MF 20% 400V
C136	1-161-742-00	s	CERAMIC 0.0022MF 20% 400V
C137	⚠1-161-742-00	s	CERAMIC 0.0022MF 20% 400V
C138	⚠1-161-742-00	s	CERAMIC 0.0022MF 20% 400V
C301	1-126-101-11	s	ELECT 100MF 20% 16V
C304	1-136-165-00	s	FILM 0.1MF 5% 50V
C305	1-136-165-00	s	FILM 0.1MF 5% 50V
C306	1-136-165-00	s	FILM 0.1MF 5% 50V
C307	1-136-165-00	s	FILM 0.1MF 5% 50V
C308	1-136-165-00	s	FILM 0.1MF 5% 50V
C309	1-124-482-11	s	ELECT 33MF 20% 35V
C311	1-136-173-00	s	FILM 0.47MF 5% 50V
CN1	9-998-107-01	o	CONNECTOR, 4P, MALE
CN2	9-998-114-11	o	CONNECTOR, 12P, MALE
CN3	9-998-106-01	o	CONNECTOR, 10P, MALE

(H BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
CN4	9-998-115-11	o	CONNECTOR, 10P, MALE
CN5	9-998-116-11	o	CONNECTOR, 6P, MALE
CN101	⚠9-998-089-01	o	CONNECTOR, 3P, MALE
	⚠9-998-051-01	o	HOUSING, 3P, FEMALE
	⚠9-998-044-01	o	CONTACT
CN102	⚠9-998-090-01	o	CONNECTOR, 6P, MALE
	⚠9-998-043-01	o	HOUSING, 6P, FEMALE
	⚠9-998-044-01	o	CONTACT
D101	8-719-510-22	s	DIODE D3SB60
D102	8-719-300-33	s	DIODE RU-3AM
D103	9-998-081-01	s	DIODE MA166
D104	8-719-300-33	s	DIODE RU-3AM
D105	9-998-081-01	s	DIODE MA166
D106	9-998-082-01	s	DIODE ERA22-02
D107	8-719-970-39	s	DIODE ESAC92M-02
D108	8-719-970-39	s	DIODE ESAC92M-02
D201	8-719-913-44	s	DIODE ERA82-004
D202	8-719-913-44	s	DIODE ERA82-004
D203	8-719-913-44	s	DIODE ERA82-004
D204	8-719-913-44	s	DIODE ERA82-004
D205	8-719-913-44	s	DIODE ERA82-004
D206	8-719-913-44	s	DIODE ERA82-004
D207	8-719-913-44	s	DIODE ERA82-004
D208	8-719-913-44	s	DIODE ERA82-004
D209	9-998-105-01	s	DIODE MA752A
D210	9-998-105-01	s	DIODE MA752A
D211	9-998-105-01	s	DIODE MA752A
D212	9-998-105-01	s	DIODE MA752A
D213	9-998-105-01	s	DIODE MA752A
D214	9-998-105-01	s	DIODE MA752A
D215	9-998-105-01	s	DIODE MA752A
D216	9-998-105-01	s	DIODE MA752A
D217	8-719-911-19	s	DIODE 1SS119
D218	8-719-911-19	s	DIODE 1SS119
D219	8-719-911-19	s	DIODE 1SS119
D220	8-719-911-19	s	DIODE 1SS119
D221	8-719-911-19	s	DIODE 1SS119
D222	8-719-911-19	s	DIODE 1SS119
D223	8-719-911-19	s	DIODE 1SS119
D224	8-719-911-19	s	DIODE 1SS119
D225	8-719-911-19	s	DIODE 1SS119
D226	8-719-911-19	s	DIODE 1SS119
D301	8-719-911-19	s	DIODE 1SS119
D302	8-719-911-19	s	DIODE 1SS119
D303	8-719-911-19	s	DIODE 1SS119
D304	8-719-911-19	s	DIODE 1SS119
D305	8-719-911-19	s	DIODE 1SS119
D306	8-719-911-19	s	DIODE 1SS119
D307	8-719-911-19	s	DIODE 1SS119
D308	8-719-911-19	s	DIODE 1SS119
D309	8-719-911-19	s	DIODE 1SS119
D310	8-719-911-19	s	DIODE 1SS119
D311	8-719-911-19	s	DIODE 1SS119
D312	8-719-911-19	s	DIODE 1SS119
D313	8-719-911-19	s	DIODE 1SS119
D314	8-719-911-19	s	DIODE 1SS119
D315	8-719-911-19	s	DIODE 1SS119

(H BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
D316	8-719-911-19	s	DIODE 1SS119
D317	8-719-911-19	s	DIODE 1SS119
F101	⚠9-998-085-01	s	FUSE 3.15A 250V (J)
	9-998-088-01	o	HOLDER, FUSE
F101	⚠9-998-086-01	s	FUSE 3.15A 250V (UC)
	9-998-088-01	o	HOLDER, FUSE
F101	⚠9-998-087-01	s	FUSE 3.15A 250V (EK)
	9-998-088-01	o	HOLDER, FUSE
FC1	9-998-128-01	o	FLAT CABLE (5 CORE)
FC2	9-998-127-01	o	FLAT CABLE (5 CORE)
IC102	8-759-820-84	s	IC L78MR05
IC302	8-759-008-70	s	IC LM358N
IC303	9-998-124-01	s	IC HA012640A or MB88514B1305K
L101	⚠9-998-074-01	s	LINE FILTER 12.5mH
L102	⚠9-998-074-01	s	LINE FILTER 12.5mH
L103	9-998-075-01	s	INDUCTOR 3.3UH
L301	9-998-122-01	s	INDUCTOR 1.8UH
LC1	9-998-096-01	o	LEAD CABLE
	9-998-098-01	o	GLASS TUBE
LC2	9-998-108-01	o	LEAD CABLE
LC5	9-998-097-01	o	LEAD CABLE
PS301			LINK, IC 2.7A
PS302			LINK, IC 2.7A
PS303			LINK, IC 2.7A
PS304			LINK, IC 2.7A
PS305			LINK, IC 2.7A
PS306			LINK, IC 2.7A
PS307			LINK, IC 2.7A
PS308			LINK, IC 2.7A
Q101	9-998-083-01	s	TRANSISTOR 2SK1217
Q102	9-998-084-01	s	TRANSISTOR 2SD973A
Q201	9-998-100-01	s	TRANSISTOR 2SA1310
Q202	9-998-100-01	s	TRANSISTOR 2SA1310
Q203	9-998-100-01	s	TRANSISTOR 2SA1310
Q204	9-998-100-01	s	TRANSISTOR 2SA1310
Q205	9-998-100-01	s	TRANSISTOR 2SA1310
Q206	9-998-100-01	s	TRANSISTOR 2SA1310
Q207	9-998-100-01	s	TRANSISTOR 2SA1310
Q208	9-998-100-01	s	TRANSISTOR 2SA1310
Q209	9-998-101-01	s	TRANSISTOR 2SB1393
Q210	9-998-101-01	s	TRANSISTOR 2SB1393
Q211	9-998-101-01	s	TRANSISTOR 2SB1393
Q212	9-998-101-01	s	TRANSISTOR 2SB1393
Q213	9-998-101-01	s	TRANSISTOR 2SB1393
Q214	9-998-101-01	s	TRANSISTOR 2SB1393
Q215	9-998-101-01	s	TRANSISTOR 2SB1393
Q216	9-998-101-01	s	TRANSISTOR 2SB1393
Q217	9-998-102-01	s	TRANSISTOR UN4211
Q218	9-998-102-01	s	TRANSISTOR UN4211
Q219	9-998-102-01	s	TRANSISTOR UN4211
Q220	9-998-102-01	s	TRANSISTOR UN4211
Q221	9-998-102-01	s	TRANSISTOR UN4211
Q222	9-998-102-01	s	TRANSISTOR UN4211

(H BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
Q223	9-998-102-01	s	TRANSISTOR UN4211
Q224	9-998-102-01	s	TRANSISTOR UN4211
Q225	8-729-321-78	s	TRANSISTOR 2SJ176
Q226	8-729-321-78	s	TRANSISTOR 2SJ176
Q227	8-729-321-78	s	TRANSISTOR 2SJ176
Q228	8-729-321-78	s	TRANSISTOR 2SJ176
Q229	8-729-321-78	s	TRANSISTOR 2SJ176
Q230	8-729-321-78	s	TRANSISTOR 2SJ176
Q231	8-729-321-78	s	TRANSISTOR 2SJ176
Q232	8-729-321-78	s	TRANSISTOR 2SJ176
Q309	8-729-422-71	s	TRANSISTOR UN411L
Q310	8-729-422-71	s	TRANSISTOR UN411L
Q311	8-729-422-71	s	TRANSISTOR UN411L
Q312	8-729-422-71	s	TRANSISTOR UN411L
Q313	8-729-422-71	s	TRANSISTOR UN411L
Q314	8-729-422-71	s	TRANSISTOR UN411L
Q315	8-729-422-71	s	TRANSISTOR UN411L
Q316	8-729-422-71	s	TRANSISTOR UN411L
Q317	9-998-102-01	s	TRANSISTOR UN4211
Q318	9-998-119-01	s	TRANSISTOR UN4222
Q319	9-998-119-01	s	TRANSISTOR UN4222
Q320	9-998-119-01	s	TRANSISTOR UN4222
Q321	9-998-119-01	s	TRANSISTOR UN4222
Q322	9-998-119-01	s	TRANSISTOR UN4222
Q323	9-998-119-01	s	TRANSISTOR UN4222
Q324	9-998-119-01	s	TRANSISTOR UN4222
Q325	9-998-119-01	s	TRANSISTOR UN4222
Q327	8-729-422-57	s	TRANSISTOR UN4111
Q328	9-998-102-01	s	TRANSISTOR UN4211
Q330	8-729-904-36	s	TRANSISTOR DTC114YS
Q331	8-729-904-36	s	TRANSISTOR DTC114YS
R101	1-249-439-11	s	CARBON 68K 5% 1/4W
R102	1-249-439-11	s	CARBON 68K 5% 1/4W
R103	1-249-439-11	s	CARBON 68K 5% 1/4W
R104	1-215-902-11	s	METAL 47K 5% 2W
R107		s	METAL 0.2 5% 3W
R109	1-247-810-11	s	CARBON 130 5% 1/4W
R110	1-247-874-11	s	CARBON 62K 5% 1/4W
R112	1-249-418-11	s	CARBON 1.2K 5% 1/4W
R113	1-249-418-11	s	CARBON 1.2K 5% 1/4W
R122	1-213-061-11	s	RES, FUSIBLE 11 5% 1W
R123	1-217-485-00	s	RES, FUSIBLE 22 5% 1W
R140		s	METAL 0.1 5% 2W
R141	1-249-439-11	s	CARBON 68K 5% 1/4W
R143	1-249-497-11	s	CARBON 7.5K 5% 1/2W
R144	1-249-497-11	s	CARBON 7.5K 5% 1/2W
R145	1-213-061-11	s	RES, FUSIBLE 11 5% 1W
R151	1-214-925-00	s	CARBON 330K 5% 1/2W
R152	1-249-405-11	s	CARBON 100 5% 1/4W
R153	9-998-078-01	s	METAL 0.2 5% 3W
R201	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R202	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R203	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R204	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R205	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R206	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W

(H BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R207	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R208	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R209	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R210	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R211	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R212	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R213	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R214	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R215	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R216	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R217	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R218	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R219	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R220	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R221	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R222	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R223	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R224	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R225	1-249-429-11	s	CARBON 10K 5% 1/4W
R226	1-249-429-11	s	CARBON 10K 5% 1/4W
R227	1-249-429-11	s	CARBON 10K 5% 1/4W
R228	1-249-429-11	s	CARBON 10K 5% 1/4W
R229	1-249-429-11	s	CARBON 10K 5% 1/4W
R230	1-249-429-11	s	CARBON 10K 5% 1/4W
R231	1-249-429-11	s	CARBON 10K 5% 1/4W
R232	1-249-429-11	s	CARBON 10K 5% 1/4W
R233	1-249-442-11	s	CARBON 510 5% 1/4W
R234	1-249-442-11	s	CARBON 510 5% 1/4W
R235	1-249-442-11	s	CARBON 510 5% 1/4W
R236	1-249-442-11	s	CARBON 510 5% 1/4W
R237	1-249-442-11	s	CARBON 510 5% 1/4W
R238	1-249-442-11	s	CARBON 510 5% 1/4W
R239	1-249-442-11	s	CARBON 510 5% 1/4W
R240	1-249-442-11	s	CARBON 510 5% 1/4W
R273	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R274	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R275	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R276	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R277	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R278	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R279	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R280	1-212-852-00	s	RES, FUSIBLE 6.2 5% 1/4W
R281	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R282	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R283	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R284	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R285	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R286	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R287	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R288	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R289	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R290	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R291	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R292	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R293	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R294	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R295	1-247-840-00	s	CARBON 2.4K 5% 1/4W

(H BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R296	1-247-840-00	s	CARBON 2.4K 5% 1/4W
R304	1-249-415-11	s	CARBON 680 5% 1/4W
R305	1-249-429-11	s	CARBON 10K 5% 1/4W
R315	1-249-415-11	s	CARBON 680 5% 1/4W
R316	1-247-828-11	s	CARBON 750 5% 1/4W
R317	1-249-415-11	s	CARBON 680 5% 1/4W
R318	1-247-828-11	s	CARBON 750 5% 1/4W
R319	1-249-415-11	s	CARBON 680 5% 1/4W
R320	1-247-828-11	s	CARBON 750 5% 1/4W
R321	1-249-415-11	s	CARBON 680 5% 1/4W
R322	1-247-828-11	s	CARBON 750 5% 1/4W
R323	1-249-421-11	s	CARBON 2.2K 5% 1/4W
R324	1-249-429-11	s	CARBON 10K 5% 1/4W
R325	1-249-419-11	s	CARBON 1.5K 5% 1/4W
R326	1-249-442-11	s	CARBON 510 5% 1/4W
R327	1-249-429-11	s	CARBON 10K 5% 1/4W
R328	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R329	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R330	1-249-429-11	s	CARBON 10K 5% 1/4W
R331	1-249-425-11	s	CARBON 4.7K 5% 1/4W
R332	1-249-405-11	s	CARBON 100 5% 1/4W
R333	1-247-868-11	s	CARBON 36K 5% 1/4W
R334	1-247-830-11	s	CARBON 910 5% 1/4W
R335	1-247-870-11	s	CARBON 43K 5% 1/4W
R336	1-249-415-11	s	CARBON 680 5% 1/4W
R338	9-998-118-01	s	METAL 0.1 2W
R343	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R344	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R345	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R346	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R347	1-249-437-11	s	CARBON 47K 5% 1/4W
R348	1-249-437-11	s	CARBON 47K 5% 1/4W
R349	1-249-437-11	s	CARBON 47K 5% 1/4W
R350	1-249-437-11	s	CARBON 47K 5% 1/4W
R351	1-249-435-11	s	CARBON 33K 5% 1/4W
R352	1-249-435-11	s	CARBON 33K 5% 1/4W
R353	1-249-435-11	s	CARBON 33K 5% 1/4W
R354	1-249-435-11	s	CARBON 33K 5% 1/4W
R355	1-249-435-11	s	CARBON 33K 5% 1/4W
R356	1-249-435-11	s	CARBON 33K 5% 1/4W
R357	1-249-435-11	s	CARBON 33K 5% 1/4W
R358	1-249-435-11	s	CARBON 33K 5% 1/4W
R362	1-214-745-00	s	METAL 4.7K 1% 1/4W
R363	1-214-745-00	s	METAL 4.7K 1% 1/4W
R364	1-214-745-00	s	METAL 4.7K 1% 1/4W
R365	1-214-745-00	s	METAL 4.7K 1% 1/4W
R366	1-214-745-00	s	METAL 4.7K 1% 1/4W
R367	1-214-745-00	s	METAL 4.7K 1% 1/4W
R368	1-214-745-00	s	METAL 4.7K 1% 1/4W
R369	1-214-745-00	s	METAL 4.7K 1% 1/4W
R370	1-214-745-00	s	METAL 4.7K 1% 1/4W
R371	1-214-745-00	s	METAL 4.7K 1% 1/4W
R372	1-214-745-00	s	METAL 4.7K 1% 1/4W
R373	1-214-745-00	s	METAL 4.7K 1% 1/4W
R374	1-214-745-00	s	METAL 4.7K 1% 1/4W
R375	1-214-745-00	s	METAL 4.7K 1% 1/4W
R376	1-214-745-00	s	METAL 4.7K 1% 1/4W

(H BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
R377	1-214-745-00	s	METAL 4.7K 1% 1/4W
R381	1-249-442-11	s	CARBON 510 5% 1/4W
R383	1-249-417-11	s	CARBON 1K 5% 1/4W
R384	1-249-429-11	s	CARBON 10K 5% 1/4W
R385	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R386	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R387	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R388	1-247-848-11	s	CARBON 5.1K 5% 1/4W
R389	1-249-429-11	s	CARBON 10K 5% 1/4W
R390	9-998-109-01	s	METAL 0.16 2W
R391	9-998-109-01	s	METAL 0.16 2W
R392	9-998-109-01	s	METAL 0.16 2W
R393	9-998-109-01	s	METAL 0.16 2W
R394	1-249-435-11	s	CARBON 33K 5% 1/4W
RY301	9-998-126-01	s	RELAY
RY302	9-998-126-01	s	RELAY
RY303	9-998-126-01	s	RELAY
RY304	9-998-126-01	s	RELAY
RY305	9-998-126-01	s	RELAY
RY306	9-998-126-01	s	RELAY
RY307	9-998-126-01	s	RELAY
RY308	9-998-126-01	s	RELAY
T101	⚠9-998-095-01	s	TRANSFORMER
TH101	9-998-091-01	s	THERMISTOR 5-OHM 1.5A
VR301	9-998-121-01	s	RES, ADJ, METAL 10K
X301	9-998-113-11	s	CERAMIC OSCILLATOR 4MHz
ZD101	9-998-079-01	s	DIODE MA4300-L
ZD102	9-998-079-01	s	DIODE MA4300-L
ZD104	9-998-080-01	s	DIODE MA4220-M
ZD105	9-998-080-01	s	DIODE MA4220-M
ZD301	9-998-110-11	s	DIODE MA4047 (N)-L
ZD302	9-998-110-11	s	DIODE MA4047 (N)-L
ZD303	9-998-110-11	s	DIODE MA4047 (N)-L
ZD304	9-998-110-11	s	DIODE MA4047 (N)-L
ZD305	9-998-110-11	s	DIODE MA4047 (N)-L
ZD306	9-998-110-11	s	DIODE MA4047 (N)-L
ZD307	9-998-110-11	s	DIODE MA4047 (N)-L
ZD308	9-998-110-11	s	DIODE MA4047 (N)-L
ZD314	9-998-111-11	s	DIODE MA4056
ZD316	9-998-112-11	s	DIODE MA4075 (N) or MA4075
ZD325	9-998-111-11	s	DIODE MA4056

I BOARD (HB01271I)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-130-01	o	MOUNTED CIRCUIT BOARD, I
CN6	9-998-147-01	o	CONNECTOR, 2P, MALE
	9-998-055-01	o	HOUSING, 2P, FEMALE
	9-998-056-01	o	CONTACT
FC3	9-998-146-01	o	FLAT CABLE (4 CORE)
Q326	8-729-401-63	s	TRANSISTOR 2SD1273
Q329	8-729-401-63	s	TRANSISTOR 2SD1273
R337	1-249-429-11	s	CARBON 10K 5% 1/4W
R378	9-998-144-01	s	METAL 0.2 1W
R379	9-998-144-01	s	METAL 0.2 1W
R380	1-249-429-11	s	CARBON 10K 5% 1/4W
R382	9-998-145-01	s	RES, FUSIBLE 11 1W
TF301	⚠9-998-148-01	s	FUSE, THERMAL 130-DEG-C 2.5A
	9-998-149-01	o	RETAINER
	9-998-150-01	o	TUBE, SHIELD

K BOARD (HB01271K)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-038-01	o	MOUNTED CIRCUIT BOARD, K
	9-998-174-01	s	BATTERY TERMINAL
C320	1-136-165-00	s	FILM 0.1MF 5% 50V
C321	1-136-165-00	s	FILM 0.1MF 5% 50V
C322	1-136-165-00	s	FILM 0.1MF 5% 50V
C323	1-136-165-00	s	FILM 0.1MF 5% 50V
FC306	9-998-171-01	o	FLAT CABLE (4 CORE)
LC3	9-998-172-01	o	LEAD CABLE

L BOARD (HB01271L)

Ref. No. or Q'ty	Part No.	SP	Description
	9-998-104-01	o	MOUNTED CIRCUIT BOARD, L
C501	1-136-165-00	s	FILM 0.1MF 5% 50V
C502	1-136-165-00	s	FILM 0.1MF 5% 50V
C503	1-136-165-00	s	FILM 0.1MF 5% 50V
C504	1-136-165-00	s	FILM 0.1MF 5% 50V
CN501	9-998-142-01	o	CONNECTOR 15P, MALE
IC501	9-998-141-01	s	IC BA10339 or AN1339
Q501	8-729-904-36	s	TRANSISTOR DTC114YS
Q502	8-729-904-36	s	TRANSISTOR DTC114YS
Q503	8-729-904-36	s	TRANSISTOR DTC114YS

(L BOARD)

Ref. No. or Q'ty	Part No.	SP	Description
Q504	8-729-904-36	s	TRANSISTOR DTC114YS
R501	1-249-413-11	s	CARBON 470 5% 1/4W
R502	1-249-413-11	s	CARBON 470 5% 1/4W
R503	1-249-413-11	s	CARBON 470 5% 1/4W
R504	1-249-413-11	s	CARBON 470 5% 1/4W
R505	1-249-818-11	s	CARBON 300 5% 1/4W
R506	1-249-818-11	s	CARBON 300 5% 1/4W
R507	1-249-818-11	s	CARBON 300 5% 1/4W
R508	1-249-818-11	s	CARBON 300 5% 1/4W
R509	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R510	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R511	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R512	1-247-846-11	s	CARBON 4.3K 5% 1/4W
R513	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R514	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R515	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R516	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R517	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R518	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R519	1-247-847-11	s	CARBON 4.7K 5% 1/4W
R520	1-247-847-11	s	CARBON 4.7K 5% 1/4W

FRAME

Ref. No. or Q'ty	Part No.	SP	Description
	⚠1-580-375-11	o	INLET, 3P
	9-998-052-01	o	LUG TERMINAL
FM301	9-998-053-01	s	FAN
SW101	⚠1-570-743-21	s	SWITCH, AC POWER

PACKING MATERIALS & SUPPLIED ACCESSORIES

Ref. No. or Q'ty	Part No.	SP	Description
	⚠1-534-754-00	s	CORD, POWER (J)
	⚠1-556-760-11	s	CORD, POWER (3 CORE) (EK)
	⚠1-557-377-11	s	CORD, POWER (3 CORE) (UC)
	3-795-581-21	o	SAFEGUARD (SONY), IMPORTANT (UC)